THE GLASS INDUSTRY

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SURVEY OF WORKING CONDITIONS IN GLASS INDUSTRY

Standards in industry as a whole are high. Few exceptions indicate need for change in methods rather than investment in additional equipment or person

The average worker in the glass industry enjoys better-than-average working conditions, although there are certain respects in which the workers' lot can be improved to the betterment of the industry as a whole, as well as that of the employees themselves. The purpose of the recently concluded survey of working conditions in this field, conducted jointly by THE GLASS INDUSTRY and the Labor Relations Institute, was to determine exactly where improvements should be made. With but few exceptions, the correction of these conditions involves a changing or tightening up of *methods*, rather than the investment of substantial sums of money in additional equipment and personnel.

Courtesy Jam Handy

Viewing the industry as a whole—container, plate, window, tableware and other branches, and in plants of every size as well as every type—there are certain respects in which the score of achievement is high. The typical glass worker is fortunately fixed in regard to the following labor-relations techniques:

Grievance procedures.
Paid vacations.
Apprentice training.
Provision of safety accessories.
Safeguards against dust, fumes and excessive heat.
Lockers for street clothing and work clothing.
Showers.
Soft-drink and candy dispensers.
Plant housekeeping.

In certain other respects the *average* glass worker is not so well blessed. The returns to the questionnaire, as filled in by 58 representative plants, revealed *low scores* in the following conditions:

Incentive systems.
Labor-Management committees.
Suggestion systems.
Retirement plans.
Profit-sharing plans.
Employee handbooks.
In-plant training.
Pre-employment training.
Printed safety rules and safety conferences.
First-aid training.
Medical personnel.
Physical check-ups.
Wash-up time.
Relaxation rooms for male workers.
In-plant eating facilities and between-meal snacks.

Purely average scores were registered by the returns on:

Rest periods.
Established methods procedure for each task.

In almost every industry, the worker in the larger plants enjoys certain labor-relations benefits which are not extended to employees of smaller companies. In the field of glass manufacturing, taking the over-all picture, workers in plants employing 500 persons or more enjoy distinct advantages over their fellow glass workers in smaller factories—especially in regard to:

Employee publications.
Established system for up-grading and promotion.
Foreman training programs.
Safety committees.
Registered nurse.
Medical room for emergency treatment.
Pre-employment physical examinations.
Separate smoking areas.
In-plant eating facilities.

Established plant housekeeping programs.

All techniques dealing with absenteeism and turnover.

A study of the accompanying table shows how little variation there is between working conditions in plants of the same size grouping—regardless of the particular branch of the industry in question. One of the few exceptions to this unanimity is the very low score—25 per cent—registered by tableware plants in the 100-to-500 bracket in response to the question, "Do you have a formalized grievance procedure?" But the same plants are notably ahead of the same-size container plants when it comes to the right of appeal from the foreman's decision when a grievance has been handled to the worker's dissatisfaction.

One of the paradoxes contained in this analysis relates to grievance procedures. Although the returns reveal a widespread interest in handling grievances, only 25 per cent of the 100-500 group require written reports from the foreman or other person interviewing the worker, and only 31 per cent of those in the over-500 category. This situation has its counterpart in the treatment of absenteeism and turnover—especially in the 100-500 group. Only slightly more than half of these concerns keep absenteeism records, conduct post-absence rievews, and keep records of turnover and reasons for leaving. Yet it has long been established by the Field Staff of the Institute that an understanding of employees' reasons for leaving or "staying out" is the key to better labor relations and improved production. Without records on grievances and why employees quit, it is difficult to maintain an even keel—especially under today's manpower situation.

The relative absence of employee handbooks is another "soft spot" in this summary of glass industry working conditions. It is the more surprising in view of the larger reliance placed upon employee publications—although it is possible that the latter may be employed to perform the handbook's duty. This assumption could be checked only by examining a representative assortment of employee publications. However, since there is such a difference between the two concepts, it would be difficult to use the one in place of the other—especially during a period of high labor turnover. An employee magazine or newspaper is helpful in sustaining worker-interest in the company and its products after he has been placed on the job: the prime function of the handbook is to *introduce* him to the company, and to acquaint him with such matters as safety rules and regulations, payroll practices, employee benefits, etc. It would appear from the survey that inadequate use is being made of this dependable tool, particularly in the 100-500 classification.

It seems also apparent that much more could be done in the field of safety. Safety conferences and safety committees comprised of key employees have long proved their worth in keeping down accident and sickness rates. First aid training is also of great help, especially in plants which lack full-time medical or nurse personnel. Remember, a factory need not be filled with whirling, hazardous machinery or noxious gases in order to make a safety program necessary. According to statistics, the most dangerous place in America is still the home! A factory without a single moving part can still supply more than its share of production-line casualties—falling, skidding, mashing, cutting still occur.

Safety work ties in closely with plant housekeeping. The high rate of interest in established plant housekeeping programs revealed by this survey is supported by the splendid returns on maintenance. Safety also is closely allied with cleanliness and health, and the two link together in the glass industry's provision of showers, lockers and other cleanliness facilities. On this score, however, there is one notable lapse—the small interest shown in relaxation rooms for male workers. Such rooms need not be elaborate or expensive, but experience has proved beyond question that relaxation space for *all* workers pays for itself many time over. Even a separate smoking area is better than nothing at all: it contributes vastly to employee morale—to say nothing of reducing loitering and crowding in washrooms.

Supplementary data not measurable in percentages—and hence not included in the tabular material—divulged only partial use of the rest-period idea, and that largely confined to women workers and minors. The psychological and physiological benefits of even the shortest break in routine have been demonstrated by many researchers. It is apparent from this survey that the glass industry is not making as much use as it could of this time-tried technique.

One of the gratifying factors established by this survey is the excellent utilization of supervisory techniques. In practically all cases, foremen settle grievances; foremen train the new workers, and—but to a lesser degree—participate in exit interviews. This is in keeping with the high "score" accorded foremen conferences, although the latter would pay higher dividends if they were to be held more frequently. Especially valuable is the exchange of information and experience in human-relations problems. After all, human relations is the core of good working conditions. Where this spirit is lacking, no amount of equipment and effort will do the job.

LABOR CONDITIONS AND PERSONNEL POLICIES IN THE GLASS INDUSTRY

NOTE: All figures are percentages.
In answering certain questions, for example Question 21, "Who trains employees in your plant?", some manufacturers indicated more than one method of training. Hence, the percentage shown is greater than 100.

		Containers		Plate Glass		Window Glass		Tableware		Any Other		All Glass	
		100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500
I. EMPLOYEE RELATIONS													
1. Do you have a formalized grievance procedure?	Yes	75	100	100	—	100	100	25	66	75	75	71	84
	No							50	16	—	25	5	10
	Informal	25	—	—	—	—	—	25	16	25	—	23	5
2. Does the worker with a grievance present it first to:	Foreman	87	75	100	—	50	—	100	100	75	50	82	73
	Shop steward	12	—	—	—	50	100	—	—	12	—	12	5
	Other	—	25	—	—	—	—	—	—	12	25	5	15
3. Is there a system of appeals from the foreman's decision?	Yes	87	100	100	—	50	100	100	100	87	75	87	57
	No	12	—	—	—	—	—	—	—	12	—	10	—
4. Is a written report made out on every grievance?	Yes	18	37	—	—	50	—	50	33	25	25	25	31
	No	81	62	100	—	50	100	—	66	75	50	68	63
5. Do you have an incentive system?	Yes	6	25	—	—	—	—	—	50	6	—	5	26
	No	31	—	—	—	100	—	50	—	31	25	35	5
	Not feasible	6	12	—	—	—	—	25	—	25	25	15	10
	For certain groups	56	62	100	—	—	100	25	50	37	50	43	57
6. Do you have a Labor-Management Committee?	Yes	18	50	—	—	—	—	—	33	18	75	15	47
	No	81	50	100	—	100	100	100	66	81	25	84	52
7. If Yes, does it contribute to better production and morale?	Yes	18	50	—	—	—	—	—	33	18	50	15	41
	No												
8. Do you expect to continue the Committee after the war?	Yes	18	50	—	—	—	—	—	33	18	25	15	36
	No												
9. Do you have a suggestion system?	Yes	43	62	100	—	—	—	25	50	37	100	38	63
	No	56	25	—	—	100	100	75	33	—	—	35	26
10. Is your suggestion system a success?	Yes	37	62	100	—	—	—	25	33	31	100	33	57
	No	6	—	—	—	—	—	—	16	6	—	5	5
11. Do you have an employee retirement plan?	Yes	18	50	—	—	—	—	—	16	12	75	12	41
	No	81	50	100	—	100	100	75	66	87	25	84	52
12. Do you have a profit-sharing plan for your employees?	Yes	6	—	—	—	—	—	—	—	12	—	7	—
	No	93	97	100	—	100	100	75	100	87	100	89	94
13. Do your production workers receive paid vacations?	Yes	100	100	100	—	50	100	75	100	87	100	89	100
	No	—	—	—	—	50	—	25	—	12	—	10	—
14. If Yes, how long are the vacations?	1 week	81	97	100	—	50	100	25	83	87	100	76	89
	2 weeks	56	97	100	—	—	—	50	33	31	50	43	57
15. Do you have an employee handbook?	Yes	18	50	100	—	—	—	—	66	31	50	23	52
	No	75	50	—	—	100	100	100	33	62	50	71	47
16. Do you have an employee publication?	Yes	56	75	—	—	—	—	25	66	18	100	33	73
	No	43	25	100	—	100	100	75	33	75	—	64	26
17. How would you rate your employees' morale?	Good	50	37	100	—	50	—	50	83	56	75	53	57
	Fair	50	62	—	—	50	100	25	16	37	25	41	41
	Poor							25	—	—	—	2	—
II. TRAINING AND PROMOTION													
18. Do you have an in-plant training program?	Yes	31	25	100	—	—	—	—	16	18	25	23	21
	No	37	—	—	—	100	—	50	16	43	—	43	5
	For certain groups	31	75	—	—	—	100	50	66	31	75	30	73
19. Do you give pre-employment training to new workers?	Yes	25	50	100	—	50	—	—	16	12	25	20	31
	No	68	50	—	—	50	100	100	83	18	75	74	68
20. Do you have an apprentice system?	Yes	93	75	100	—	50	—	75	83	62	50	76	89
	No	6	25	—	—	50	100	25	16	37	50	23	31
21. Who trains employees in your plant?	Foremen	100	97	—	—	100	100	75	100	93	50	92	84
	Special trainers	12	62	100	—	—	—	25	33	37	75	25	52
	Gov't instructors		25	—	—	—	—	—	—	—	—	—	10
22. Do you have an established system for up-grading and promotion?	Yes	43	62	100	—	—	100	25	50	56	100	46	68
	No	56	37	—	—	100	—	50	50	42	—	51	31
23. Do you have a foreman training program?	Yes	37	100	100	—	—	100	25	83	37	75	35	89
	No	62	—	—	—	100	—	75	16	62	25	64	10
24. Do you hold foremen meetings or conferences?	Yes	93	100	100	—	100	100	50	100	68	100	79	100
	No	6	—	—	—	—	—	25	—	31	—	17	—
25. If Yes, how frequently?	Weekly	12	12	—	—	—	—	50	33	25	50	20	26
	Semi-monthly	18	25	100	—	—	—	—	—	18	—	17	10
	Monthly	25	62	—	—	—	—	25	33	6	25	15	41
	Occasionally	6	—	—	—	100	100	—	33	18	25	28	21

(*Continued on page* 250)

RUSSIAN LABORATORY GLASS

IN Transactions of the All-Union Conference on Analytical Chemistry, vol. 2,431-438.1943, M. A. Bezborodov gives an interesting account on the laboratory glass manufactured in Russia.

From about 1900 to about 1930 one kind of glass played the dominant part in production of laboratory vessels of every type. It had been worked out by V. Ye. Tishchenko in 1899 and received a gold medal at the World Exhibition in Paris in 1900. Its designation is "No. 23," and analysis of an average sample shows

SiO_2	Al_2O_3	Fe_2O_3	B_2O_3	CaO	MgO	Na_2O	K_2O
68.57	3.46	0.32	2.49	8.36	0.81	9.66	6.10%

In Table I its chemical endurance is compared with those of those of "Jena 1920" and "Pyrex Laboratory Glass." The composition of the first of these glasses is SiO_2 74.73, Al_2O_3 5.21, B_2O_3 7.40, Fe_2O_3 0.19, CaO 1.15, MgO traces, BaO 3.37, Na_2O 7.95, and of the second SiO_2 80.50, Al_2O_3 2.00, B_2O_3 11.80, Fe_2O_3 0.25, CaO 0.29, MgO 0:06, ZnO 0.70, Ny_2O 4.40, and K_2O 0.20%. The tests have been perfomed by heating 2N NaOH, 2N Na_2CO_3, and N H_2SO_4 in round-bottom flasks for 3 hours at 100°C and determining the loss of weight per 1 dm^2 of the geometrical glass surface. In the last column the loss of weight per 1 dm^2 is given after boiling of similar flasks with water for 10 hours. It is seen that "No. 23" exceeds both "Jena 1920" and "Pyrex" in its resistance to caustic soda, but is attacked by sulphuric acid more easily than is "Pyrex," and is inferior to both its rivals as far as resistance to soda and to water is concerned. Its thermal endurance is not outstanding, but it does not devitrify in the course of glass-blowing.

TABLE I

Chemical endurance of three laboratory glasses

Loss of weight in mg. per sq. dm.

Glass	Reagent			
	2 NaOH	2N Na_2CO_3	N H_2SO_4	water
"No. 23"	49.33	34.00	0.248	2.10
"Jena 1920"	53.90	24.04	0.430	1.89
"Pyrex"	83.75	26.86	0.220	1.89

The chemical resistivity of "No. 23" glass has been compared also with that of "Glass T" of Greiner and Friedrichs, Germany, as well as with those of a Swedish and a Scottish glass. The Swedish glass had the best resistivity against caustic soda and sulfuric acid but the worst against sodium carbonate and against water, while the Scottish glass took exactly the opposite position. If the glass showing the highest endurance towards a reagent gets one point, the second best two points, etc., then the totals obtained for the four glasses tested with caustic soda, sodium carbonate, sulfuric acid, and water were: "No. 23" 15 points, Swedish 14 points, "Jena 1920" 14 points, and "Pyrex" 14 points. The other two glasses have been tested with only two or three reagents.

After about 1930 manufacture of four other glass types was inaugurated in Russia, although production of "No. 23" has not been discontinued. Table II represents the theoretical composition of the new glasses.

TABLE II

Composition of Russian laboratory glasses

Oxides	Designation of the glass			
	No. 846	Pyrex-type	Neutral	Improv. white
SiO_2	74.0	80.5	72.5	72.0
$Al_2O_3 + Fe_2O_3$	3.0	2.0	4.0	1.5
B_2O_3	3.0	12.0	6.0	none
CaO	6.0	0.5	7.0	10.0
MgO	4.0	none	none	2.5
Na_2O	10.0	4.0	10.5	14.0
K_2O	none	1.0	none	none

Their mechanical endurance has been tested in the same manner as those of "No. 23," "Jena 1920" and "Pyrex," and the data obtained are listed in Table III.

TABLE III

Chemical endurance of Russian laboratory glasses

Loss of weight in mg. per sq. dm.

Glass	Reagent		
	2 N NaOH	N H_2SO_4	water
"No. 23"	47	0.4	1.8
"Pyrex-type"	90	0.2	0.5
"Improv. white"	52	0.4	2.0
"No. 846"	52	0.3	1.5
"Neutral"	38	0.4	2.0

In Table IV data on the thermal endurance of these glasses are collected. Tubing, about 50 mm. long and having external diameter of 15 mm., was subjected to a rapid temperature change, and the temperature difference causing destruction of the tube, noted. (Exact conditions are not mentioned in the original paper.) It is, naturally, the smaller the thicker is the tube, and the values are given in the table for 3 wall thicknesses.

TABLE IV

Thermal endurance of Russian laboratory glasses

Destructive temperature difference in °C

Glass	Wall thickness in mm.		
	0.5	1.0	2.0
"No. 23"	160°	140°	120°
"Pyrex type"	360°	280°	250°
"Improv. white"	160°	140°	120°
"No. 846"	190°	170°	140°
"Neutral"	210°	180°	160°

The properties of these five glasses are sufficiently varied to satisfy all the usual laboratory requirements. However, a research work is still going on with the view of finding an "universal" glass, i. e. which is tolerably good under all conditions without being outstanding in any special respect, and working out special glasses eminently adapted to a narrow purpose.

THATCHER INSTALLS NEW BATCH PLANT AT OLEAN

By ROY S. ARRANDALE
Thatcher Manufacturing Company, Elmira, N. Y.

A new batch plant, representing a marked departure from the conventional design, is now in full operation at the Olean, N. Y., factory of the Thatcher Manufacturing Company. The new facilities, representing a complete unit for unloading and storage of raw materials; crushing of cullet; collection and weighing, and mixing of glass batch is housed compactly in a single silo 31 ft. in diameter by 110 ft. high from the grade. The project was designed and built by the John L. Klug Construction Company of Rochester, N. Y.

The silo wall is of radial tile construction, the live load overhead being carried on a supporting framework of steel extending up from the basement level. The silo footing, intermediate floors and roof are all of reinforced concrete. The bins overhead in cross section are annular and segmental sections of the 31 ft. circle which is the silo cross section. The bin partitions are of radial tile construction also. The total combined capacity of the 10 bins is 1160 tons of raw material.

The plant overall, therefore, comprises a huge upright cylinder, fed with raw materials at the bottom, which are elevated and distributed at the top into separate annular and segmental cells, which are made to discharge by gravity into a central collection hopper for weighing, thence to the mixer and then into a mixed batch elevator for transportation to the furnaces.

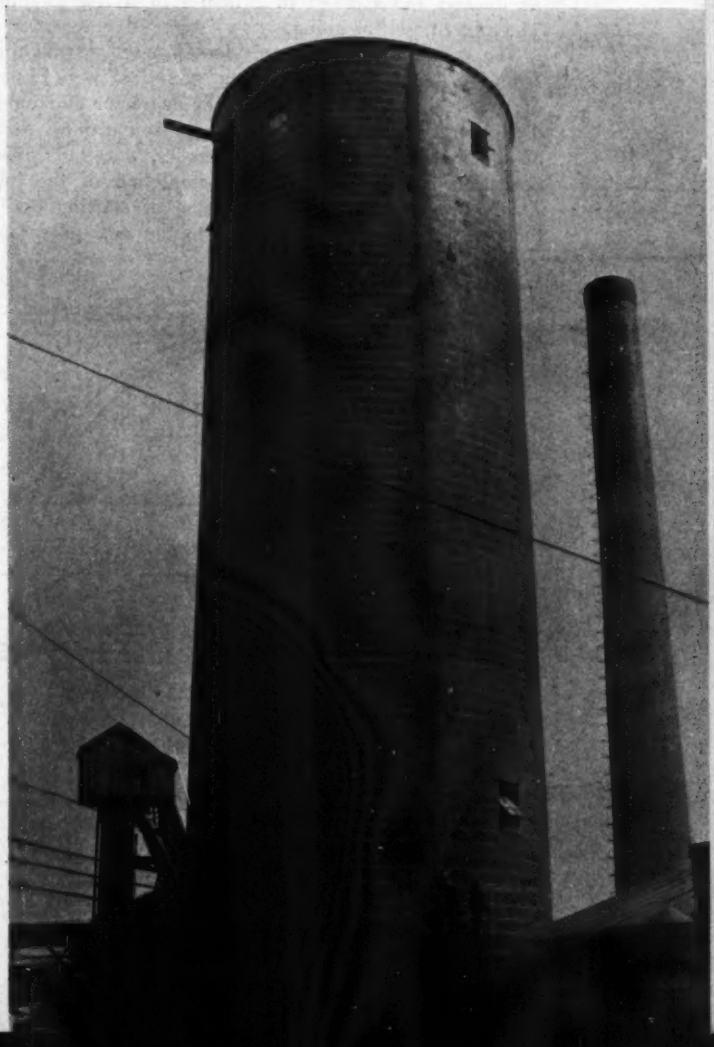
The old batch plant comprised four bins in-line for bulk storage of raw materials. Collecting and weighing was done in a scale car in a tunnel under the bins. Even though the equipment in the old plant was unsalvagable the old storage bins themselves were usable and were necessary to make up adequate total storage capacity. The new silo was therefore designed and built to use this old storage as an integral part of the operation and the end of the old tunnel is open to the basement of the new silo.

Railroad cars are unloaded at the new silo, a dump-hopper for gondolas and a car scoop which is run up on a ramp for box cars. A vibrating feeder conveys material from the track to the boot of the main elevator. The third floor (scale floor) is the transfer point, wherein the material being unloaded, can either be switched to another elevator running from that point up through a segmental well to the top of the silo, or can be switched to the cross belt running out across the top of the bins in the old plant. The major quantity of incoming material is unloaded directly into the silo, but the old bins absorb the surge in incoming rail shipments. This material is later reclaimed on the belt which runs in the tunnel underneath the old bins. The reclaiming belt is fed from a spout which is pulled along on a track on the conveyor frame. The reclaiming belt itself discharges into the same elevator which also serves the railroad track. Raw material therefore can be recycled through the old bins.

On the top floor of the silo is a distributing belt arrangement which can be swung around to feed any one of the individual compartments separately. The charging door of each bin is equipped with a lock, a different key for each material. These are under the supervision of the foreman. Bin level indicators reading at the ground level are to be installed when available.

Cullet is handled separately. The feed hopper is at grade level in the outside wall of the silo and accommodates a dump truck. Later, a pair of overhead bins which are being built onto the outside silo wall will provide intermediate storage of off ware and will discharge by gravity to the feed hopper. In the crusher line, all of which is located in a well between the grade floor and the basement, a short flight conveyor and magnetic separator feeds into the primary jaw crusher, the discharge from which is elevated onto a vibrating screen. The fines are by-passed while the coarse continues to a secondary gyratory crusher for further reduction. The cullet elevator then takes the combined total directly to the top of the silo. The discharge chutes (two different cullets are handled) are in step arrangement so as to make the material flow over itself insofar as possible.

The bottoms of the storage bins are coned and the discharge openings are arranged for free-flow of mate-



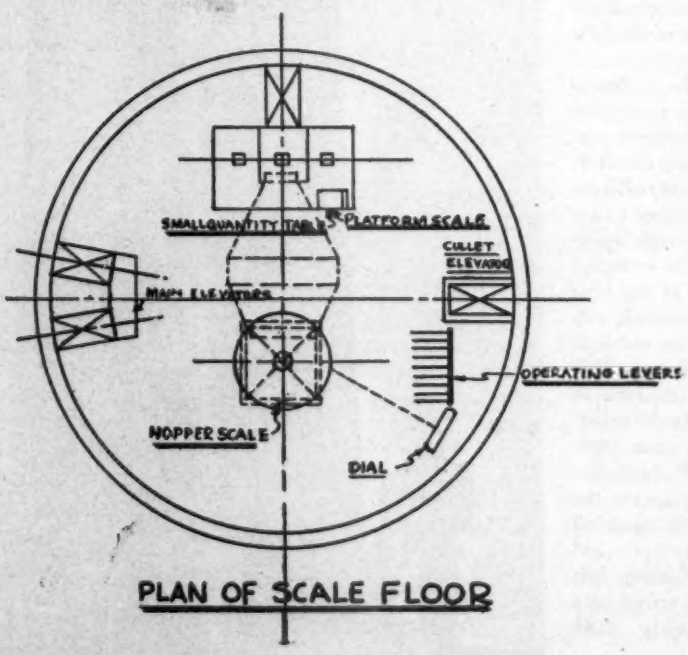
rials. Square pipes lead down from the openings to the scale hopper. The flow gates themselves are controlled by a cable and pulley system connected to a set of levers located in front of the scale dial. Their action is very positive and rapid. Weighing is done on a 5,000 lb. "Printweigh" scale.

Three of the bins, containing minor batch components, also discharge to a work-table on the floor and the materials are weighed up on a bench scale. The scale hopper also has a trap door operated by a foot pedal for the admission of materials which are used in small amounts.

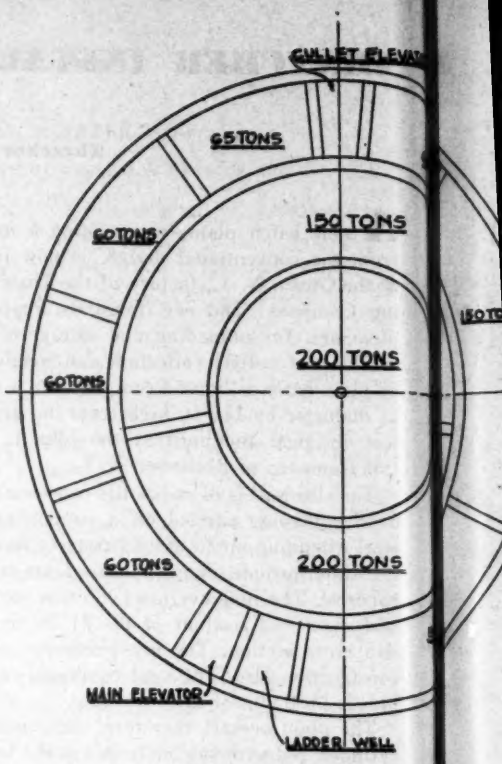
There is plenty of room on all four levels for storage of materials received in bags or barrels. A hoist well up from the basement, with a small electric hoist and rail at each of the three floors, is available so that material can be lifted up quite easily from any point in the building. The first floor will also contain a locker and shower room when completed.

The T. L. Smith mixer itself, on the second floor, is of dust proof construction with a hydraulically operated tilting mechanism. The mixed batch is then elevated to a level from which it can chute by gravity to a swing trough arrangement putting mixed batch on one or the other of two conveyor belts taking mixed batch to the furnaces. Two different colors are mixed. Aside from the two cullet elevator boots, the mixed batch elevator boot is the only point in the system that has to be cleaned. These are of special construction which can be opened and cleaned in a matter of a few minutes. The mixer is self cleaning.

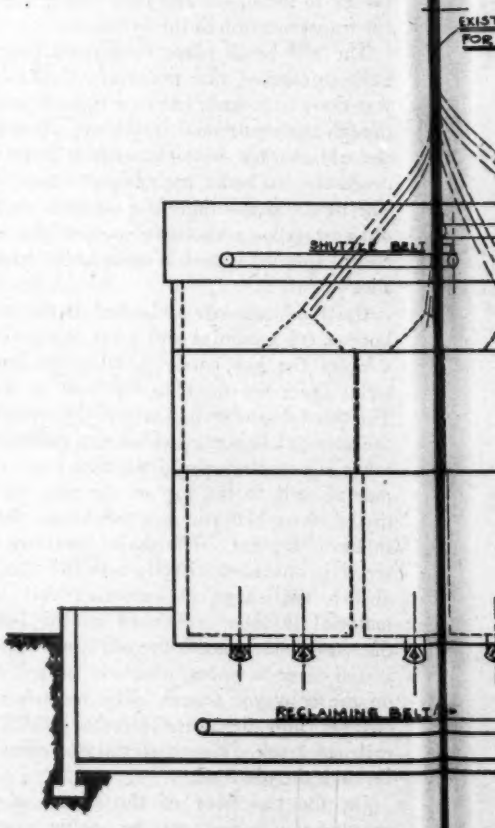
The operation of the unit has proceeded smoothly from the start. A few "bugs" or "gremlins" were found, of course, but these were of minor character and remedied quickly. By making temporary connections, parts of the system were, through necessity, put into initial operation a month before the completion of the job. This, however, made a nice method of starting up in that the transition from the old to the new proceeded with no loss in production time.

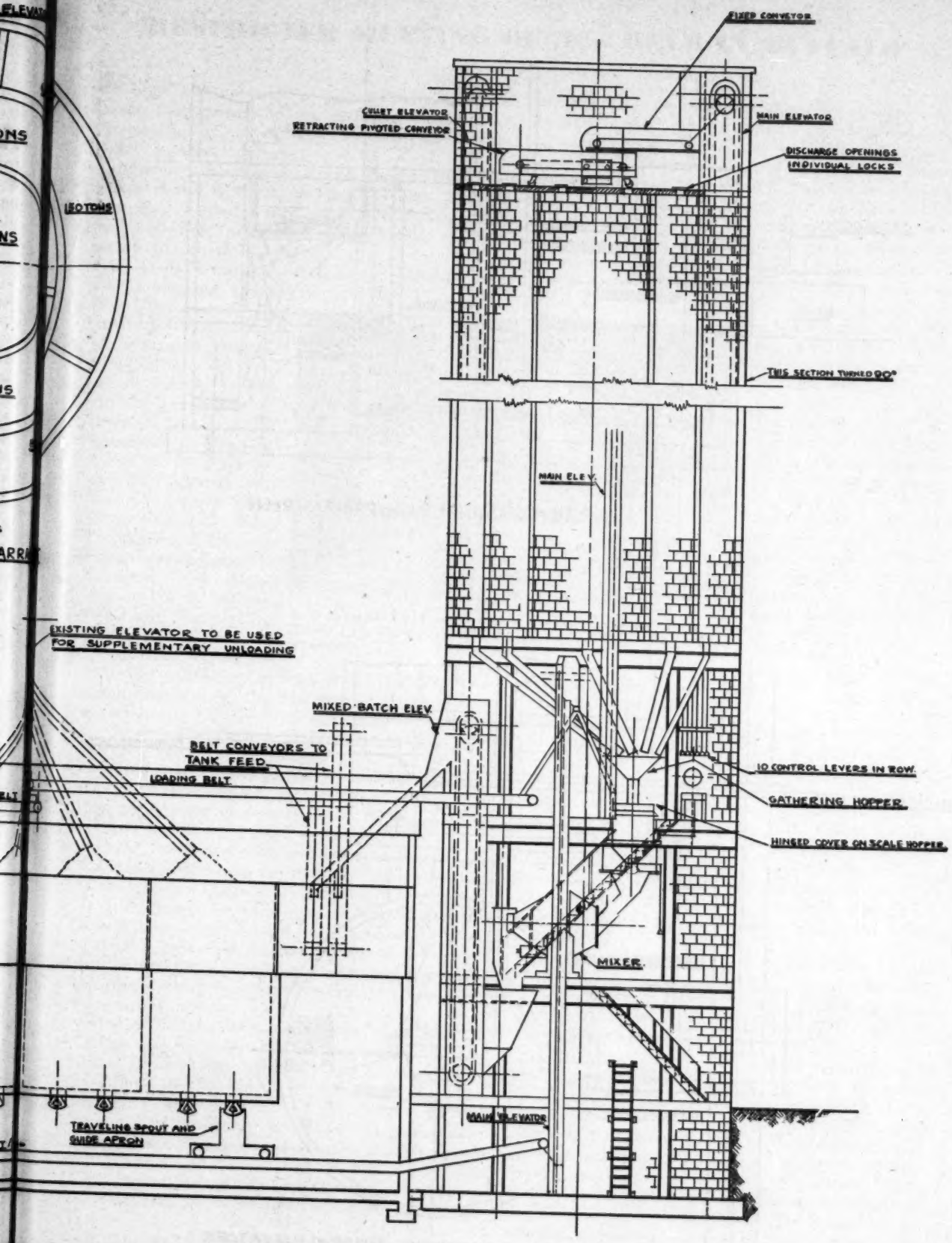


PLAN OF SCALE FLOOR

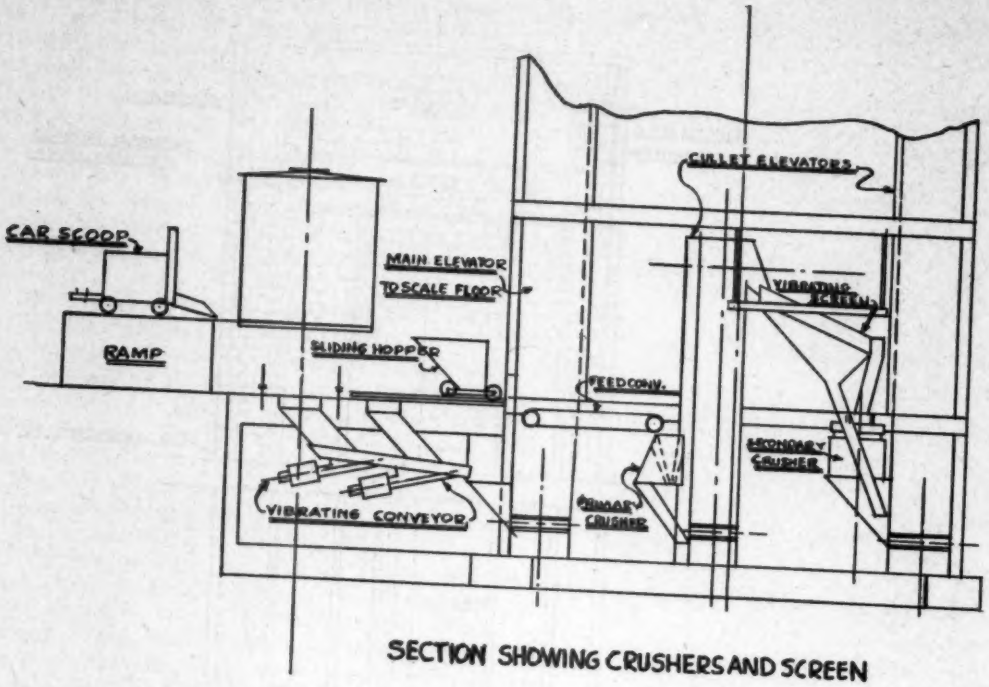


PLAN SHOWING BIN ARR

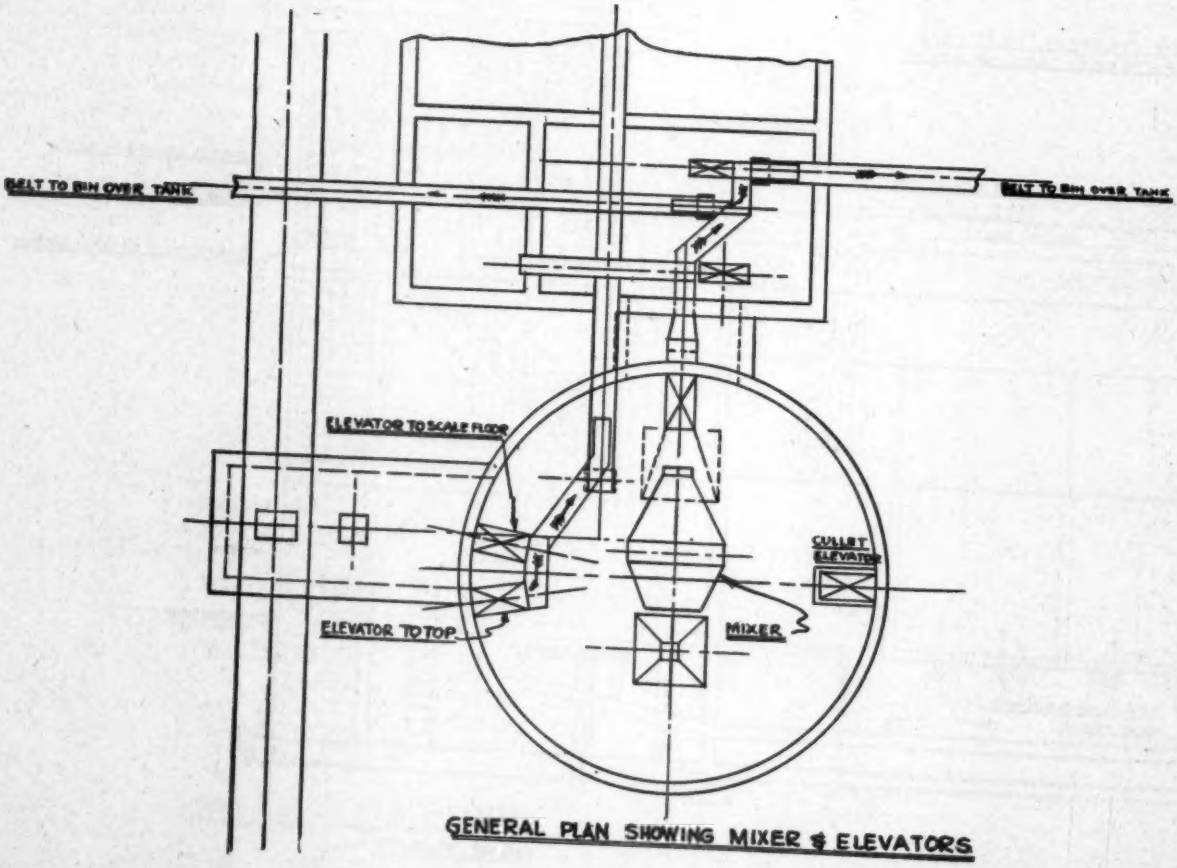



FIXED CONVEYOR
CULET ELEVATOR
RETRACTING PIVOTED CONVEYOR
MAIN ELEVATOR
DISCHARGE OPENINGS INDIVIDUAL LOCKS
160 TONS
THIS SECTION TURNED 90°
MAIN ELEV.
EXISTING ELEVATOR TO BE USED FOR SUPPLEMENTARY UNLOADING
MIXED BATCH ELEV.
BELT CONVEYORS TO TANK FEED
LOADING BELT
10 CONTROL LEVERS IN ROW
GATHERING HOPPER
HINGED COVER ON SCALE HOPPER
MIXER
TRAVELING SPOUT AND SLIDE APRON
MAIN ELEVATOR

NEW PLANT



SECTION SHOWING CRUSHERS AND SCREEN



GENERAL PLAN SHOWING MIXER & ELEVATORS

RESTRICTED MEETING OF ACS HELD IN BUFFALO

Because ODT restrictions on travel eliminated the regular Forty-Seventh Annual Meeting of the American Ceramic Society an emergency session was held in Buffalo on April 16th.

Only forty-one members from outside the Buffalo area were permitted to attend. However, this attendance was augmented by approximately one hundred members from the Upstate New York Section, thereby forming a quorum for the transaction of business.

Dr. Louis Navias of General Electric Company, was elected Chairman of the Glass Division. O. G. Birch of Owens-Illinois Glass Company, became Vice-Chairman and Samuel R. Scholes remains as Secretary. J. S. Gregorius continues as Trustee of the Division.

New officers of the Society are C. Forrest Tefft, The Clay Craft Company, Columbus, Ohio, President; J. R. Hansen, Ferro Enamel Company, Cleveland, Vice President, and J. D. Sullivan of Battelle Memorial Institute, Treasurer.

Left to right: Dr. Ross C. Purdy, General Secretary; Edwin H. Fritz, Past President, and C. Forrest Tefft, newly elected President.

Four Local Sections are headed by glassmen: Chairman of the Baltimore-Washington Section is W. Ronald Lester of Maryland Glass Corporation. A. H. Couch of Libbey-Owens-Ford heads the Northern Ohio Section. The Southern California Section is under the Chairmanship of C. S. Chaffee of Latchford-Marble Glass Company and H. H. Hanna of the Crystal City, Missouri plant of Pittsburgh Plate Glass Company presides over the St. Louis Section.

Edwin H. Fritz who has just completed his term of office as President emphasized in his address to the assembled members the importance of the continuation of the Society's campaign to increase its membership. He also stressed the desirability of increasing income through other means so that Local Sections can obtain financial assistance and to make possible additional technical work by the Society. A specific recommendation was for the establishment of a research fund to sponsor a a few worthy projects.

First on the program of the meeting of the Board of Trustees was the acceptance of the report of the committee discontinuing the autonomous organization of the Fellows and the merging of their affairs in the general affairs of the Society. Dr. L. E. Barringer read the report of the Special Committee and recommended that several committees be established to carry on certain activities such as the Orton Lecture, the development of standards and the establishment of nomenclature, these activities having been previously sponsored by the Fellows.

A committee appointed by the Chairman of the Pittsburgh Local Section and headed by Dr. A. Paul Thompson reported with recommendations for strengthening the work of the Local Sections. Dr. Thompson said that the committee was in favor of some financial support for the Local Sections as well as help with the organization of programs. The Board of Trustees then adopted a plan to give each Local Section a refund of one dollar from the annual dues of any member registered in the Local Section and attending the meetings. It referred the other recomendations of this committee to the Executive Committee with instructions to review them and act where necessary.

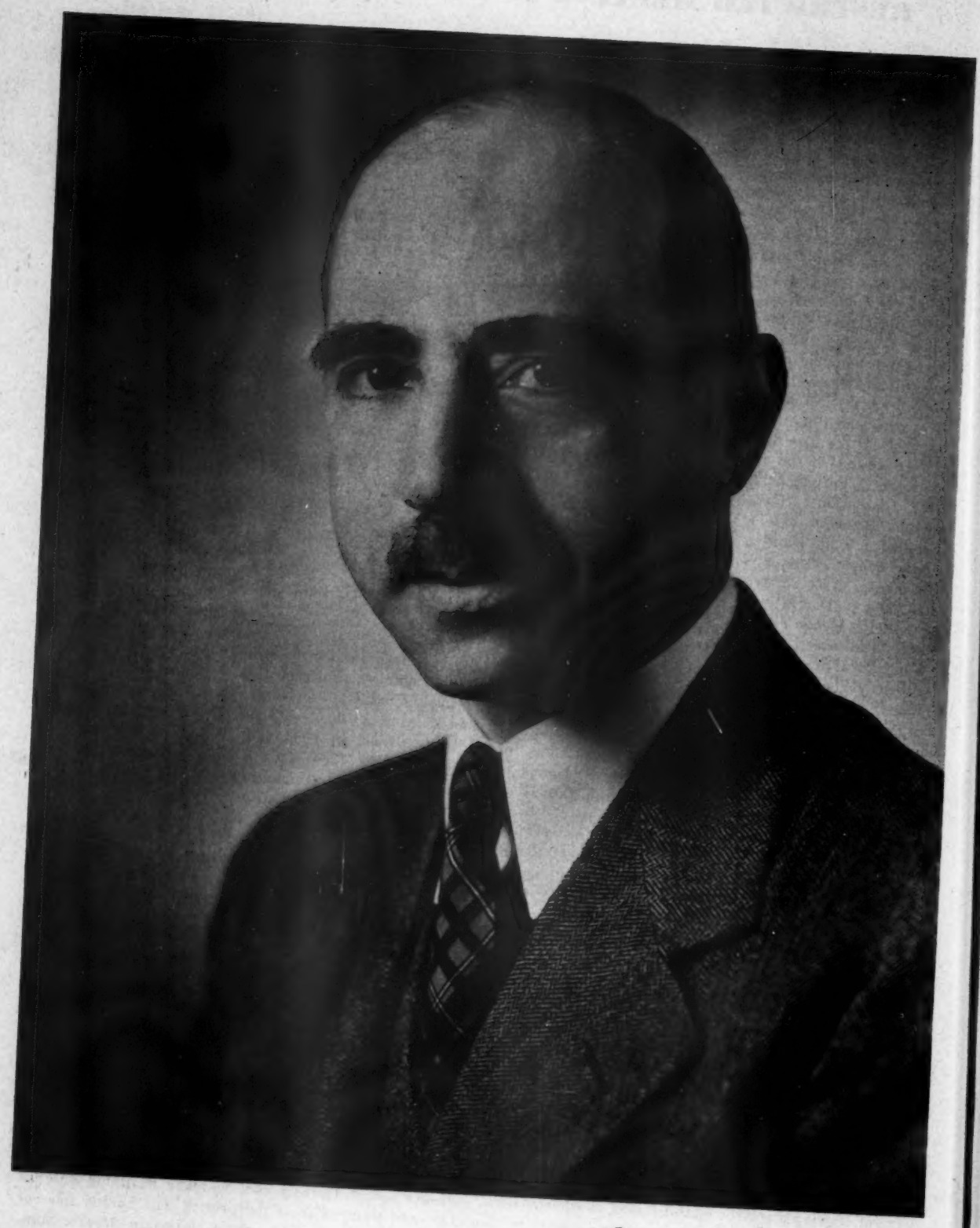
Recommendations for two new Divisions which had been received during the year were discussed, these being Steatite and Thermal Insulation. It was decided that a Division for the steatite industry would not be useful at this time and it was recommended that the members continue as a part of the White Wares Division. The field of thermal insulation is so broad that further study of such a grouping was recommended and put over to another meeting of the Board for consideration.

The staff was instructed to continue with plans to secure the publication of a new group of phase diagrams and to combine them with the ones which have already been published in 1933 and 1938. The usefulness of these diagrams, especially to students, was emphasized.

The report of the Committee on an Endowment Fund was presented by the Chairman, V. V. Kelsey. This report recommended against an endowment fund due to the low rate of interest which could be earned today, but did recommend that the subject be studied further with the idea that a permanent research fund might be raised and replenished from time to time as the money was expended.

The following members were elected Fellows of the Society: Frank W. Preston, Walter C. Rueckel, Kenneth C. Lyon, Walter A. Weldon, Paul S. Dear, Hans Thurnauer, Burnham W. King, Jr., Wesley G. Martin, Edward E. Callinan, and Waldo W. Higgins.

It has been customary, over a number of years, for THE GLASS INDUSTRY to publish summaries of papers presented at the Annual Meetings. As a result of the cancellation of the regular meeting many of the papers scheduled for presentation have been delayed while others, according to advice from the Headquarters of the Society, may not be put in type immediately. Hence, proofs for abstracting can be made available only as they are received from the printer. The Society has cooperated in forwarding proofs of certain papers. Summaries of these, and others as they are received, will appear in subsequent issues of THE GLASS INDUSTRY.



Louis Navias

COLORED GLASSES

A review of a Monograph by W. A. Weyl appearing in "The Journal of the Society of Glass Technology," Sheffield, England

PART III

The third installment of Dr. Weyl's Monograph on Colored Glasses appeared in the August 1944 issue of the British *Journal of the Society of Glass Technology*. It deals with all ionic colors in glass except iron, which was treated in the foregoing section and reviewed in GLASS INDUSTRY, Vol. 25, page 405, 1944.

Ionic Colors

These ionic colors are:

Vanadium	V^{5+}, V^{4+}, V^{3+}
Chromium	Cr^{6+}, Cr^{3+}
Manganese	Mn^{7+}, Mn^{3+}, Mn^{2+}
Copper	Cu^{+}, Cu^{2+}
Cobalt	Co^{++}
Nickel	Ni^{++}
Uranium	U^{6+}, U^{4+}
Titanium	Ti^{4+}
Tungsten	Wo^{6+}
Molybdenum	Mb^{6+}
The Rare Earth Elements and Cerium: Nd^{3+}, Pr^{3+}, Ce^{3+}	

In the individual chapters dealing with each of these colorants the author discusses (a) the chemistry of the coloring element, (b) the color imparted by its ions to aqueous solutions and crystals, (c) the color imparted to glass and the correlation of this color to the kind of ion formed, (d) the influence of glass composition on ions formed and the color, (e) some properties of the glasses thus colored, particularly their behavior in the melt.

This reviewer has attempted to summarize the discussion of the monograph on ions formed and colors imparted by each element in tables 1-8.

Vanadium

The color of vanadium glasses is too similar to that of the chromium glasses to justify the higher cost involved. Vanadium occurs in glass as V^{5+}, V^{4+} and V^{3+}. The effect of these ions is summarized in table 1. Pure vanadate glasses containing V^{5+} in the VO_4^{3-} group are nearly colorless and their absorption lies in the UV. They must be extremely basic and consequently are instable and impractical. Most practical glasses contain combinations of V^{3+} and V^{4+}, causing blue to green colors. If V^{5+} is also present, grey colors occur. Vanadium glasses fluoresce brown, probably beeause of the fluorescence of the VO_4^{3-} group.

Vanadium-Cerium glasses are yellowish green, but change to purple in sunlight. This reaction is used to register the total UV irradiation in climate studies.

Chromium

Chromium occurs in glass as Cr^{3+} or, much less frequently as Cr^{6+}. Cr^{3+} imparts a green color which is not changed very much if it is forced into the anionic grouping CrO_2^- by the addition of alkali. The color is characterized by absorption maxima at about 450 and 650 mμ. The latter is a doublet. Reducing agents eliminate the absorption around 400 mμ. Because Cr^{3+} transmits beyond 650 mμ, the chromium green is not suitable for signal glasses and is only used as a modifier of the bluish cast. Cr^{6+} appears only in very alkaline, particularly potassium glasses under high oxygen pressure. Its position with respect to the surrounding oxygen ions always corresponds to the chromates in aqueous solutions and the resulting absorption curve is characterized by a cutoff near 500 mμ, somewhat similar to that of the cadmium sulfide glasses. In lead glasses it is nearly red. Lead also eliminates the transmission of some parts of the UV in goggles colored with chromium.

The crystallization of Cr_2O_3 from the melt leads to the historical aventurine glasses. A section on chromium pinks deals with colored crystalline phases formed in ceramic glazes.

Manganese

The ions formed in glass are Mn^{3+}, Mn^{2+} and, rarely, Mn^{7+}. Their function is summarized in table 3. Mn^{3+} is usually present in small concentrations, but predominates by its strong absorption band between 450 and 550 mμ and the resulting deep purple color. Most of the manganese is present as Mn^{2+} but its absorption is weak. Its faint brownish color becomes apparent, if nearly all Mn^{3+} is reduced to Mn^{2+} by arsenic or antimony; Mn^{2+} also fluoresces with red to green color. In glasses containing both manganese and arsenic, much more manganese is needed to promote the purple of Mn^{3+}. While this combination, therefore, seems merely wasteful, the practical glassmaker using it is justified because arsenic "buffers" the (Mn^{3+} : Mn^{2+}) equilibrium with respect to changes in the oxidation-reduction effects of the furnace atmosphere. Manganese glasses containing arsenic are more stable and better reproducible from melt to melt. Conversely, the Mn^{3+} content can be increased by chromates. Mn^{7+} is unstable. Its green color is usually only an intermediate color and its formation requires high alkalinity of the melt, such as attained in some alkali borates.

Copper

The influence of the relative concentration of Cu^{+} and Cu^{2+} ions as well as of their coordination and of the base glass are discussed extensively because of the commercial importance of the copper signal glasses. The most significant facts are summarized in table 4. Cu^{+} is colorless, but its simultaneous presence with Cu^{++} intensifies the color. Cu^{++} absorbs in the yellow-red (above 600) and in the purple (below 450) and thus imparts a blue color. Base glasses favoring a low coordination (borosilicate, magnesia, lead glasses), cause

the absorption to shift to higher wave lengths and the blue color shifts to a bluish green, since the transmission in yellow increases. The exact absorption conditions caused by various ingredients systematically varied in green signal glasses can be found in the original text. Uncharged copper precipitates to form the red copper ruby glass which will be treated in a later section of the monograph.

Cobalt

The only cobalt ion active in glass coloration is the divalent Co^{2+}. It colors glass green, blue or pink. The blue color is common and is ascribed by Weyl to the Co^{2+} ion in the fourfold co-ordination which is predominant in the commercial soda lime glasses. The pink color which is observed in highly acidic borate glasses is ascribed to a higher coordination number and becomes manifest in the vanishing of an absorption band in the red. On heating, the red band reappears and the color becomes bluer. The green color appears if oxygen is replaced by chlorine, bromine and particularly iodine.

Both the pink and blue Co^{2+} centers cause no UV absorption which makes them important constituents of mercury lamp filters.

The action of the Co^{2+} ion is summarized in table 5.

The monograph gives many details on the chemistry of cobalt containing pigments.

Nickel

The coloration due to nickel is conditioned in a way similar to that of cobalt. The yellow nickel color corresponds to the pink, and the purple to the blue cobalt color. The purple color is believed to be caused by Ni^{2+} in fourfold, the yellow color by the same Ni^{2+} in sixfold (higher, more saturated) coordination. The latter color is associated with an absorption band at 440 mμ, while in the purple center two other bands above 550 and around 650 occur. At the same time the 440 mμ band shifts to higher λ. Only the purple center absorbs in the near infrared. As in cobalt glasses heating favors the lower coordinated, in this case the purple color center.

These conditions are summarized in table 6.

Purple nickel glasses show dichroism, since in thick layers their relative red transmission becomes more manifest.

Uranium

Uranium glasses are usually yellow-green and exhibit a strong green fluorescence. Both color and fluorescence are caused by the hexavalent U^{6+} in the form of a cationic group, the so-called uranyl: UO_2^{2+}. The hexavalent ion is also capable of forming anionic groups in uranates. It was discovered recently that very basic and lead containing glasses exhibit yellow to red uranate colors resembling selenium ruby glasses.

The rarer U^{4+} glasses have absorption curves resembling those of the rare earths and giving rise to many colors dependent upon the base glass. They are favored by the presence of strong reducing agents.

The uranium ions in colored glass are summarized in table 7.

Titanium

In the absence of other colorants and under normal oxidizing conditions titanium does not color glass. It strongly affects, however, the absorption curve caused by nearly all other coloring and non-coloring constituents of glass. The cerium-titanium yellow is particularly well known, but effects on iron, copper, uranium, etc., have been observed. The partial reduction of Ti^{4+} to Ti^{3+} gives rise to purple colors which are observed in acidic phosphate and borosilicate glasses.

Tungsten and Molybdenum

The oxides of these elements which are based upon the hexavalent forms are not very soluble in silicate glasses. In phosphate glasses they can be introduced and reduced to colored forms of lower valency such as, perhaps, Mo^{5+}. The resulting Wo glasses are blue, Mo glasses orange.

Rare Earths and Cerium

Table 8 summarizes the coloring action of the rare earths and cerium. Pr^{3+} imparts a green color which is not distinctive enough to warrant its use. Nd^{3+} imparts a beautiful purple characterized, in contrast to other glass purples, by its brilliant reddish color in artificial light. The typical lack of yellow transmission exactly in the area of the D-line is a property of neodymium glasses now well known to glass makers and applied to various problems of vision and illumination. Added to selenium pink it yields an intensive pink color, to praseodymium a dichroitic olive green—red brown effect. Neodymium glasses are dichroitic also and art glass made from them displays an attractive variation of color with thickness and illumination. Cerium is present in glass as Ce^{4+} and Ce^{3+}. It is the partial reduction to Ce^{3+} or the shift to lower coordination of Ce^{4+} which causes a shift of the absorption from UV to beyond 400 mμ and yellow to brown colors. This effect is also obtained by heating.

This section on the chemistry of all ionic color centers in glass may be considered a unique guide to chemists engaged in the synthesis of colored glass. The discussion refers to the most complete bibliography on glass colors published so far.

TABLE 1
Vanadium Colors

Colorant	*Color*	*Absorption Maxima*	*Composition*	
V^{5+} (VO_4^{3-})	colorless	UV	extremely alkaline	
V^{4+} (VO^{2+} vanadyl)	blue	long waves	conventional	reduction by sulfur especially in borates
V^{3+}	green	425, 625		more reduced

TABLE 2
Chromium Colors

Colorant	*Color*	*Absorption Maxima*	*Composition*
Cr^{6+} (CrO_4^{2-})	a. yellow	below 500	a. High oxygen pressure, very alkaline glasses, particularly K^-
	b. red		b. in Pb glasses
Cr^{3+} (CrO_2^-)	green	650 (two); 450	usual glasses (transmission at 400 increases in the presence of reducing agents (As_2O_3), as Cr^{3+} increases)
(crystallized)	opaque, metallic		"aventurine" glass

TABLE 3
Manganese Colors

Colorant	*Color*	*Fluorescence*	*Absorption Max. mμ*	*Composition*
Mn^{7+} (rare, instable)	green	——		very alkaline borates
Mn^{3+}	purple	——	450 - 550	oxidizing conditions; alkali; oxidizing agents: chromates
a. low coord. little disturb.	a. bluish	——	525 narrow	a. K^+
b. high coord.	b. reddish	——	475 broad	b. Na^+, Li
$Mn^{3+} + Mn^{2+}$				all real glasses contain both Mn^{3+} and Mn^{2+}; the former in smaller concentration but more conspicuous.
Mn^{2+}	faint brown			reducing conditions reducing agents: arsenic, antimony
a. little disturb.		a. green	slight in the blue purple	K^+
b. much disturb.		b. red		Na^+, R^{2+}, little or no alkali

TABLE 4
Copper Colors

Colorant	*Color*	*Absorption Maxima*	*Composition*
low-coord. high temp.	green	higher λ	borosilicates, magnesia, lead
Cu^{++}	blue-green	below 450 and above 600	
low temp. high coord.	blue	lower λ	soda lime
$Cu^+ + Cu^{++}$	intensive blue-green		
Cu^+	colorless	——	high temperature, borates, high acidity
Cu°	Treated in a later installment of the monograph		

TABLE 5
Cobalt Colors

Color Center	*Color*	*Absorption Maxima*	*Composition*
a. high coord. low temp.	blue	520, 580, 620	alkaline
Co^{2+}	blue	intermediate	soda lime
b. low coord. high temp.	pink	520; 580 and 620 degenerated and shifted to lower λ	borates, borosilicates
Co°	small concentration perhaps present, influences glass metal bond		

TABLE 6
Nickel Colors

Colorant	*Color*	*Absorption Maxima*	*Composition*
a. low coord. high temp.	purple	500, 550, 650	alkaline; quenched
Ni^{2+}	grayish	intermediate	soda lime
b. high coord. low temp.		440; high λ degenerate	acidic; tempered

TABLE 7
Uranium Colors

Ion	*Color*	*Absorption Type*	*Glass*
Uranates	yellow to red	Cutoff above 550	Basic and Lead Glasses
U^{6+} Uranyl (UO_2^{2+})	green-yellow (green fluorescence)	420, small at 480	most glasses
U^{4+}	various	rare earth type (many sharp bands)	reduced

TABLE 8
Rare Earths and Cerium Colors

Ion	*Color*	*Absorption Maxima*	*Composition*
Pr^{3+}	green	many bands	nearly the same color in all glasses
Nd^{3+}	purple	many bands (strongest at D line)	nearly the same color in all glasses
high temp. low coord. Ce^{4+}	yellow	400	
low temp. high-coord.	colorless	UV	
Ce^{3+}	yellow		

N. J. KREIDL

NEW GLASS CONTAINER GROUP IS FORMED

As was recently announced, a new association of glass container manufacturers has been incorporated to take the place of the dissolved Glass Container Association. This new group, incorporated in Columbus, Ohio, is known as the Glass Container Manufacturers' Institute, its active membership being comprised of non-defendant manufacturers in the government's anti-trust suit.

Although the group exists as a corporation the many and varied details concerning by-laws, activities, election of officers, etc., are yet to be consummated. Certain of these angles have been discussed with the Department of Justice and Judge Frank Kloeb of the U. S. District Court in Toledo, the trial judge in the monopoly case.

In a recent statement Fred E. Fuller, of the firm of Welles, Kelsey, Coburn and Harrington, handling the legal details of the Institute, declared that the new association would devote itself to the development of standards, traffic problems, industry coordination with wartime government agency actions and the compilation of statistics and dissemination of research data.

When final legal details are ironed out a meeting of all members will be called for the purpose of adopting rules and the election of officers and directors.

Incorporators of the new Institute are: Louis F. Gayner, Gayner Glass Works, Salem, N. J.; George F. Lang, Carr-Lowery Co., Baltimore; Francis H. May, Foster-Forbes Glass Co., Marion, Ind.; John H. Rau, Fairmount Glass Co., Indianapolis; Robert L. Warren, Brockway Glass Co., Brockway, Pa.; and Roy R. Underwood, Knox Glass Associates, Knox, Pa.

SUPREME COURT IS ADAMANT ON BASIC RULINGS IN HARTFORD CASE

Only three principal changes made in Supreme Court's review of its own mandate

Early last month the Supreme Court handed down its final decision in response to the Government's petition for clarification or reconsideration of the High Court's decision which modified the District Court's decree in the anti-trust case against the Hartford-Empire Company.

A four to two decision left no doubt as to the attitude of the Supreme Court with regard to its original judgment of Judge Kloeb's decree and with the exception of some comparatively minor changes requested by the Government in points five, six and seven of its petition the Court remained adamant on its original decision.

In delivering the majority opinion of the Court Mr. Justice Roberts, before particularizing on the eight points enumerated for clarification, declared, "We have no occasion to reconsider the opinion as respects the necessity for modification of the decree entered by the District Court. In the many cases which have come here for review of decrees in suits brought by the Government for violation of the Sherman Law, it has never been suggested that this Court must accept the decree fashioned by the trial court, if we affirm that court's findings as to violation of the statute, and cannot modify the terms of relief as drafted by the court below. The practice has been the contrary. This is not only in conformity to the unquestioned power of an appellate court in an equity cause, but because it suits under the Sherman Act, it is unthinkable that Congress has entrusted the enforcement of a statute of such far reaching importance to the judgment of a single judge, without review of the relief granted or denied by him."

The three points on which the Supreme Court agreed to revise the phraseology of its original decision were as follows: Point 5 is revised to include the words "or leases" so that there can be no question that Hartford is required to lease or license all equipment. Point 6 relating to licensing of independent machinery manufacturers now requires Hartford "to license all applicants to make, use, or sell the patented machines at reasonable royalties." In Point 7 of the Government's petition the term "reasonable royalties" was dealt with. The Supreme Court's final opinion in connection with this phase of the petition is as follows:

"The Government apprehends that the use of the word 'standard' with respect to the royalties to be charged by Hartford may be taken as a determination that present royalties *are* reasonable. To avoid any misunderstanding we substitute for the phrase 'standard royalties' the phrase 'uniform reasonable royalties.' Such uniform reasonable royalties may include rental of the machines, the servicing of the machines, or the use of the patents for production of glassware on the leased machines, the licensee to have the option at his election to take and pay for any or all of these privileges. Hartford should also be required to license the patents for manufacture for use or sale, but with the limitation that similar licenses at uniform reasonable royalties must be available to all who desire them."

In the dissenting opinion Mr. Justice Rutledge went into considerable detail in disagreeing with Justice Roberts' majority ruling. He stated in part:

"The necessity for a second opinion, in effect a further detailed writing of the decree in this case, gives added point to the view expressed in an earlier dissent, 323 U. S. ———, that this Court should not undertake the long distance writing of the detailed provisions for relief, amounting to a framing of the decree, in Sherman Act proceedings. I do not say that Congress has entrusted enforcement of the Sherman Act 'to the judgment of a single judge.' I do say that his judgment upon the facts of this case is necessarily better informed than that of appellate judges, however conscientious or industrious; and accordingly his findings, when they are sustained without qualification upon the character and extent of the violation, are entitled to similar weight upon the character of the relief required, unless they exceed the limits imposed by law or amount to a clear abuse of discretion. Many of the detailed revisions made here in the decree cannot qualify in either category. A court which so accurately found the facts and made conclusions concerning the violation hardly can have erred so consistently or so grossly as this Court's action necessarily implies was the case."

This final decision of the Supreme Court, in effect, brings to conclusion the protracted anti-monopoly litigation involving Hartford-Empire Company and certain glass manufacturers. It now remains for the District Court in Toledo to revise its decree in conformity with the findings of the High Court.

C. W. CARLSON SUBMITS POSITION OF HANDMADE GLASSWARE MANUFACTURERS ON TRADE AGREEMENTS

On May 1st C. W. Carlson, president of the United States Glass Company appeared before the House Ways and Means Committee on behalf of the Handmade Glassware Section of the American Glassware Association and his own company in connection with House Bill 2652 relating to extension of Trade Agreements.

In his remarks to the Committee Mr. Carlson pointed out the position of the handmade glassware industry from a standpoint of the effect of lowered tariffs on American labor in this section of the glass manufacturing industry and the over-all results of competition from foreign made ware on the industry as a whole.

The presentation made by Mr. Carlson was replete with factual statistics pertaining not only to American glassware production in this field but also data on importation of foreign made ware of the same type.

Also included in the presentation was a two part article which appeared in the January and February issues of THE GLASS INDUSTRY entitled "Survival of U. S. Hand Made Glassware Depends on Tariff Protection."

A copy of this article together with other material including a suggested amendment to H.R 2652 incorporating an excerpt from the Mexican Reciprocal Trade Agreement was distributed.

INVENTIONS AND INVENTORS

A Summary of United States Patents of Interest to the Glass Industry Issued During March

Furnaces

As a means of overcoming the batch dust incident to charging a melting furnace, George W. Batchell of Toledo suggests that certain of the materials be enveloped within a shell of molten glass. One method of doing this is shown in Fig. 1 from his patent 2,371,213. Materials are melted to form a glass which is flowed into the furnace past a mandrel or separator 24 which gives a tubular product; a screw propeller located within the mandrel forces the remaining batch materials in solid unmelted form through the mandrel to fill the tubular form. The bladed wheels 62 may either crimp the tube to hold the powdered batch in place or may even pinch off the tube to form glass briquettes enveloping glass batch. The product of this unique extrusion may be fed directly to a glass furnace or may be stored for later use.

Feeding, Forming and Shaping

For shaping such ware as ampoules from elliptical glass blanks Jakob Dichter of Berlin-Schoneberg, Germany, provides apparatus in patent 2,371,991 (vested in the Alien Property Custodian), which avoids the regional overheating of the blanks which because of their lack of roundness may occur due to the flame failing to be applied equally to the entire perimeter. In the apparatus he describes there is a system of elliptical gearing which rotates the blank at a constantly varying angular velocity to equalize the heating.

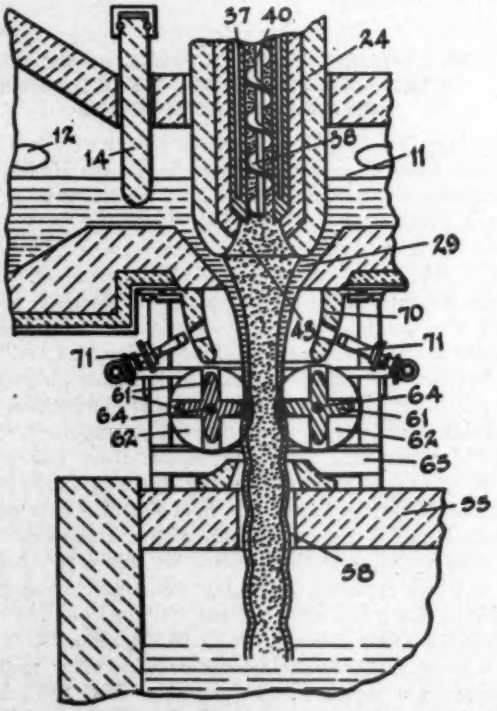


Fig. 1. Bachell : 2,371,213 Enveloping batch materials in a glass tube to minimize dust.

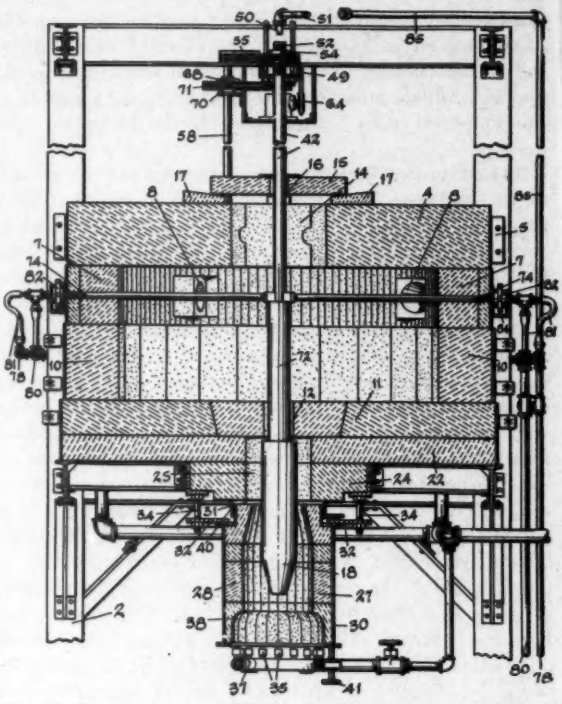


Fig. 2. Danner : 2,370,618 Day tank from which the glass flows around a heated mandrel to form it for tubing.

Patent 2,370,618 granted to Edward Danner of Newark, Ohio, describes the use of a day tank in forming glass tubing. Some details of the feeding apparatus are shown in Fig. 2. This view shows a vertical section of a day tank heated by burners directed tangentially into the tank. An outlet 12 in the bottom of the tank allows the glass to flow over and be shaped by a mandrel 18 which is supported from above the top of the furnace by a rod. Lateral adjustment of the rod can be made from the sides of the tank. Proper working conditions are provided at the mandrel by burners under the tank which heat the surfaces of a refractory housing which surrounds the forming element.

Miscellaneous Processes

Processes for the finishing of optical glass are described in patents 2,372,535 and 2,372,536 granted to Victor Walker of Fort Erie, Ontario, Canada, (AlnCin Inc.). In the first of these, an optical element is ground to a curved surface but the final finishing is accomplished by means of an apparatus which oscillates the blank against a resilient surface within a bath of acid. This requires a curved mold having the final form, and a rubber liner which lies against it, and against which the glass is oscillated. The nature of the acid will vary with the glass composition but may in some cases be

a mixture of sulphuric and hydrofluoric acids. Walker's second patent also utilizes an acid solution to apply the finish to optical glass blanks. He recites the technical shortcomings of the normal grinding processes in which a piece of glass stock is ground with successively finer grades of abrasive and finally with the finest of rouges. He states that not all of the abraded particles are broken loose and freed but that some may be eneveloped into the surface of the glass by the successive finishing steps. He refers to the "Beiby layer" named for the work of Sir George Beiby in demonstrating that the surface and subsurface layers of conventionally ground and polished glass objects comprise mechanically flowed and stressed glass of heterogeneous formation as distinguished from the perfect structures which they appear to be under superficial examination. The improved process which Walker offers consists of interrupting the abrading process before final finishing to apply an intermediate step which removes all debris from the glass surface. This step is a combined reducing and cleaning process consisting of chemically treating the surface with an acid mixture. For a soda-lime-silicate glass he might use sulphuric and hydrochloric acids in a 10 to 1 ratio at a temperature of 150 F. This is not intended to etch the glass but merely to free its surface of debris and wiped-over voids, after the removal of which the polishing may proceed in the normal manner.

Still another patent on methods and apparatus for grinding lenses is 2,371,303 granted to Benjamin Liebowitz of Lewisboro, N. Y.

Fig. 3 shows the apparatus of patent 2,371,786 in which Arthur F. Turner of Brighton, N. Y. (Bausch & Lomb Optical Co.), proposes to produce an exceedingly fine powdered abrasive product for polishing glass. This is done by evaporating the product within a vacuum and allowing it to collect on a suitable support. The material to be evaporated is supported within a crucible 19 above which is a heating element 21 and a hemispherical collector 17. All of this is housed within a bell jar which is evacuated. When the heating element is energized, the evaporant, which may be magnesium fluoride or other suitable polishing agent, is volatilized and then deposited on the collector. Turner reports that the deposited film generally begins to loosen and crack away from the surface of the support when the film reaches substantially one micron in thickness. The thickness can be checked by counting interference bands on a small section of the support which is shadowed from the direct molecular beam from the material being evaporated by a small shield 25 supported adjacent a portion of the undersurface of the support 17. A thicker coating builds up here without falling off and the interference bands are counted at the edge of the shadowed area. Eventually the deposit intended for use as a polishing agent is merely brushed from the depositing surface and stored in a liquid until ready for use.

The apparatus just described is similar in form to that which has been used for depositing reflection reducing films, as of calcium fluoride, to optical surfaces in thicknesses of one-quarter the wave length of light. One of the inventors in this field is Glenn L. Dimmick of Indianapolis, Ind. (RCA). His patent 2,338,233 issued a year ago disclosed that a mixture of calcium fluoride

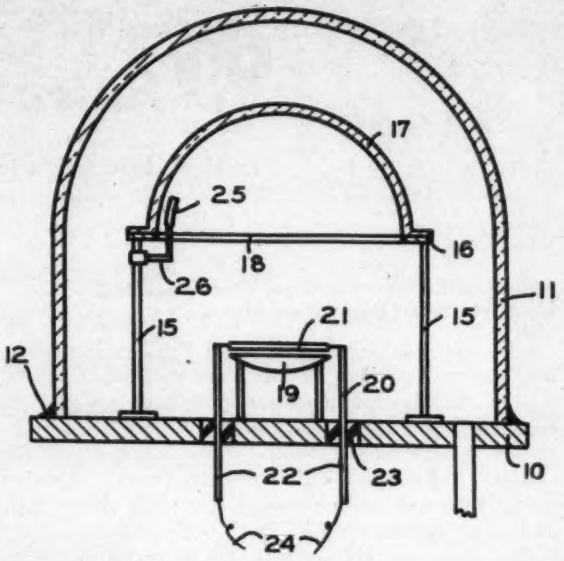


Fig. 3. Turner : 2,371,786 Depositing a one to three micron layer of condensed magnesium fluoride to be used later for fine polishing.

and aluminum oxide produced a coating approaching the optical properties of the fluoride alone but being harder and more adherent. Now he reports in patent 2,371,611 that a still better coating is made by volatilizing calcium fluoride and aluminum fluoride in the proportions of their lowest melting mixture or eutectic. A small amount of alumina is added for adheision. He makes the interesting observation that while the two fluorides may be combined in wide proportions they evaporate in the proportions of their eutectic. The mixture which he prefers to use is 45.5 per cent calcium fluoride, 49.5 per cent aluminum fluoride and 5 per cent aluminum oxide.

An alloy described by Walter E. Kingston of Sylvania Electric Products Co. (2,371,627) as being suitable for sealing to glass of Corning G-1 or G-12 types consists of 38 to 45 per cent nickel, 3 to 15 per cent chromium, and the balance substantially all iron except, if desired, for the addition of some manganese to facilitate casting.

Miscellaneous patents include 2,372,156 to Harry C. Buchman of Anchor Hocking Glass Corp. for a glass screw cap, 2,371,265 to Don Ray of Beverly Hills, Calif. for a machine for applying decorative seals over the corked opening of a bottle, and 2,371,419 to Christian N. Bergmann of Pittsburgh, Pa., for a switch mechanism for glass container conveyors. When interposed between a single conveyor and two or more others, it serves to combine the several streams of containers into one or to split one into several. A washer for bottles is disclosed in patent 2,2371,140 granted to E. R. Alling and others of the Adams Corp., Tonawanda, N. Y.

Sheet and Plate Glass

Jos. A. McCormick, Jr., of Forest Park, Ill., discloses in patent 2,372,215 (Dearborn Glass Co.) how he separates a section of glass from a larger sheet to make an opening in it. The glass is first scored on the top sur-

(*Continued on page* 243)

GJI Research Digest

Practical Interpretations of Glass Technology

Effect of Temperature on Homogenizing Rate of Soda-Lime-Silica Glass

In a previous paper, Tiede and Tooley have shown that under conditions of minimum convection mixing and in the absence of refractory contamination, that the density spread (a measure of the homogeneity) decreased rapidly during the first sixteen hours of melting at 1400°C (a drop of 9°C in density spread) following which further decrease occurred at a much slower rate, amounting to but an additional 6°C drop in density spread from the sixteenth to the sixty-fourth hours. It was also found that the portion of glass responsible for the major part of the density spread was a light fraction, which tended to form or accumulate at the surface of the melts.

In the presnt work *(Journal of the American Ceramic Society*, February, 1945) density spread measurements have been made on a series of melts of a soda-lime-silica glass prepared at temperatures ranging from 1232° to 1454°C for a four hour period and in the absence of furnace refractory and under conditions of minimum convection mixing. A sharp drop in density spread in the range 1232° to 1288°C, a minimum at about 1325°C, and a slowly increasing density spread at temperatures above 1325°C were observed.

The portion of the glass responsible for the major part of the density spread was found to be concentrated in the top half of the glass at both 1232° and 1454°C. At the higher temperature, the improvement in the homogeneity of the bottom layer was more marked than that observed in the top layer as compared with the results obtained on the lower-temperature melt. The density spread of the glass in the bottom layer in the case of the high-temperature melt was in the range of that observed for commercial soda-lime-silica glass of good quality.

A possible explanation for the observed increase in density spread at higher temperature (above 1325°C) is offered on the basis of more rapid initial segregation during melting at higher temperatures as inferred from the density-spread data and from chemical analysis of the glass from the top and bottom portions of melts made at 1232° and 1454°C.

The loss in weight of the glass due to volatilization was also determined at 1232° and at 1454°C and was found to amount to less than 0.01 per cent for a four hour melting period at both temperatures.

It was also found that moderate mixing, achieved by repeated cracking and remelting of the glass and by melting the glass in a rotating tilted crucible, had a marked effect in lowering the density spread (increased the homogeneity).

In the previous paper the following point of view was expressed, "temperature, time, and convection mixing charcteristic of a tank operation, in comparison with the experimental conditions observed herein, are very effective in improving homogeneity, especially when a dehomogenizing tendency caused by the refractories is also present in the tank operation." The data afforded by these present experiments lend further emphasis to this view that the convection currents in commercial tank operations are highly significant in improving the homogeneity of a soda-lime-silica glass.

The Glassy Matrix in Tank Blocks

Most refractory materials consist of crystals set in a glassy matrix and their properties are determined as much by the character of the glassy matrix as by the nature, size and qualities of the crystals themselves. Partridge and Seal *(Journal of the Society of Glass Technology*, April, 1944) report on the results of an investigation on the degree of fluidity of the glassy matrix in specimens of tank blocks and have tried to correlate it with their resistance to corrosin by molten glass.

Specimens cut from refractory blocks employed in the walls of glass tank furnaces were subjected to a small tensile stress of 500 grams per sq. cm. at 1350°C for long periods. Differences in the rate of creep were observed. Some specimens extended rapidly and failed in a few hours, others extended much more slowly and did not fail up to 300 hours. It was suggested that differences in the nature of the glassy matrix account for the different behaviour of these specimens; and the conclusion was drawn that the face of a tank block exposed to molten glass consists of crystals set in a matrix which must be a viscous glass rather than a solid at the temperatures of tank furnace operation.

In general, blocks possessing the more viscous matrix were more resistant to corrosion by molten glass than those which failed in a few hours under this high-temperature creep test. The effect of an addition of substances to sillimanite-clay mixtures to produce denser tank blocks and to promote crystallization of mullite was investigated from the point of view of resistance to "creep" at high temperatures and to corrosion by molten glass. It was found that refractory material possessing a dense texture as a result of an addition of fluxing materials is not necessarily as resistant to corrosion by molten glass as a similar refractory possessing a less vitreous texture due to the absence of fluxes. The most durable block is likely to be that in which vitrification and recrystallization have taken place by adequate burning at high temperatures because the viscosity of the matrix glass so produced will be higher than that resulting when fluxes are added.

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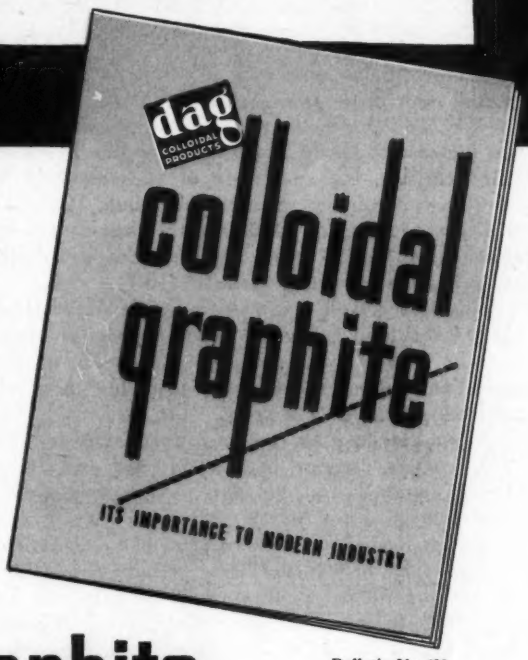

Bulletin No. 430

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CURRENT STATISTICAL POSITION OF GLASS

February activity in the glass industry varied slightly from the level shown for January. As reported by the Production Index, output for February was $46,000,000 as compared with $48,000,000 during January. This compares with $47,000,000 reported for February of 1944. Production for January and February, 1945, totalled $94,000,000.

Plate glass production for March, 1945, totalled 8,996,095 sq. ft. as reported by the Hughes Statistical Bureau. This is an increase of 22 per cent over production in the preceding month and an increase of 3 per cent over March, 1944. For the first quarter of 1945 a total of 25,274,180 sq. ft. has been produced as compared to 24,428,605 sq. ft. produced in the same period of 1944.

Glass container production for March was reported at 8,812,343 gross—a new high for the past year. It is an increase of about 17 per cent over the figure shown for February, but a decrease of approximately 3 per cent from the figure reported for March, 1944. During the first quarter of 1945 glass container production totalled 24,338,519 gross, as compared to 24,816,210 gross for the same three months of 1944.

Shipments of glass containers during March (including export shipments) were 9,298,440 gross, compared to 7,556,279 gross for February—an increase of 23 per cent. Total shipments reported for the first three months of 1945 were 25,150,302 gross.

Inventories on glass containers for March were 4,803,219 gross, a decrease of about 10 per cent from the figure reported for February. This compares with 4,779,600 gross for March 1944.

As was reported in these columns last month a change in the source of statistical data pertaining to glass containers necessitated publication of January and February, 1945, figures at the same time. Since publication of these tables revised figures have been received. The changes indicate increases in shipments for both months in all classes of ware and are as follows: Total narrow neck is 4,950,121 gross for January and 4,592,237 gross for February. Wide mouth total for January is 3,123,528 gross; for February 2,835,211 gross. The grand total of both narrow neck and wide mouth for January is 8,295,583 gross and for February 7,556,279 gross.

Automatic tumbler production for February totalled 3,066,931 dozens, representing a decrease of about 1 per cent from the preceding month of January and also a decrease of 31.9 per cent in comparison with the corresponding month of February, 1944. Shipments of automatic tumblers for February totalled 3,668,611 dozens as compared to 4,127,369 dozens for January, and showed a decrease of 4.6 per cent from February a year ago. Finished stocks on hand as of the end of February were 4,145,488 dozens as compared to 5,629,238 dozens for February 1944—a decrease in inventory of 27.1 per cent.

Table kitchen and household glassware: Manufacturers' sales of machine-made table, kitchen and household glassware for February were reported at 2,168,112 dozens, a slight decrease from the 2,705,002 dozens shipped in the preceding month, but a decided increase of 51.8 per cent over the corresponding month of February, 1944. Shipments for the twelve month period ending February, 1945, amounted to 29,669,414 dozens.

Employment and payrolls: The total number of persons employed in the glass industry during February were 87,600. This compares with 88,000 employed in

GLASS CONTAINER PRODUCTION AND INVENTORY

(All Figures Are in Gross)

		Production Mar. 1945	*Stocks Mar. 1945*
Foods: Medical & Health Supplies; Chemical, Household, Industrials; Toiletries & Cosmetics	Narrow Neck	2,772,110	1,961,498
	Wide Mouth	2,937,427	1,298,292
Dairy Products		271,037	159,188
Home Canning		131,147	433,935
Beverages		600,457	330,374
Beers		1,170,467	153,688
Liquors		615,689	331,290
Wines		216,437	117,019
Packers' Tumblers		97,572	17,935
Total		8,812,343	4,803,219

GLASS CONTAINER SHIPMENTS

(All Figures Are in Gross)

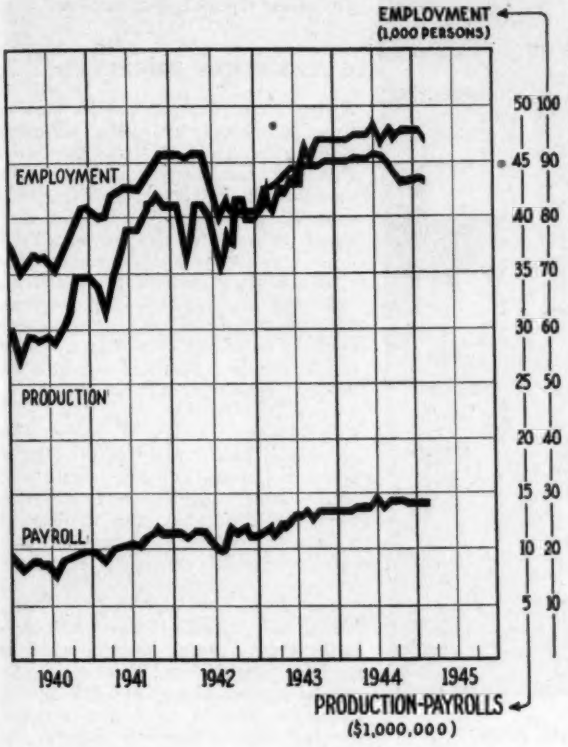
Narrow Neck Containers	*Mar. 1945*
Foods	652,311
Medical & Health Supplies	1,161,551
Chemical, Household, Industrials	602,379
Beverages	578,264
Beers	1,117,098
Liquors	556,275
Wines	221,937
Toiletries & Cosmetics	581,304
Sub-Total (Narrow Neck)	5,471,119
Wide Mouth Containers	
Foods	2,344,785
Dairy Products	287,892
Home Canning	176,364
Medical & Health Supplies	292,753
Chemical, Household, Industrials	158,867
Toiletries & Cosmetics	226,827
Packers' Tumblers	105,153
Sub-Total (Wide Mouth)	3,592,641
Total Domestic	9,063,760
Export Shipments	234,680
Total Shipments	9,298,440

January, and with 91,000 employed during February, 1944.

Payrolls for February were $14,500,000—the same as reported for January. During the first two months of the year glass manufacturers paid approximately $29,000,000 in salaries.

GJ THE GLASS INDUSTRY'S INDEX

Monthly Trends Through February, 1945



CORNING OFFERS STOCK TO GENERAL PUBLIC FOR FIRST TIME

Public offering was recently made, by an underwriting group, of 50,000 shares of Corning Glass Works 3½ per cent Cumulative Preferred Stock, $100 par value, at $100 per share, and 412,340 shares of Corning's $5.00 par Common Stock at $25.00 per share. This is the first time that stock ownership of Corning Glass Works has ever been made available to the general public.

The preferred stock represents new financing by the Company, which is contemplating a program of modernizing and expanding its manufacturing facilities and plants. The common is part of the 2,635,508 total shares resulting from a recent four for one split of the old common. The company will receive none of the proceeds from the sale of the common, which was sold to the underwriters by certain stockholders several of whom are descendants of Amory Houghton, the founder of the organization.

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Whether cutting tube glass, fragile forms, pyrex, plate or laminated glass, fused or crystalline quartz, you'll find the Bevil Diamond Impregnated Cut-off Wheel the *best* for the job.

The patented BEVIL process actually *flows* the rim and body together. This fusion bonding produces in the Bevil Cut-off Wheel a 3-way bond: (1)–Between body and rim. (2)–Between the metal itself in the rim. (3)–Between the metals and diamonds in the rim.

Under ordinary conditions Bevil Cut-off Wheels will cut *faster* and last longer than any other diamond-impregnated blade on the market. This means less shut-downs for change-over, lower blade costs per cut and lower production costs.

Send today for Bulletin No. 3 describing the Bevil Diamond Impregnated Cut-off Wheel in detail, giving sizes and prices.

Cryco, Inc.

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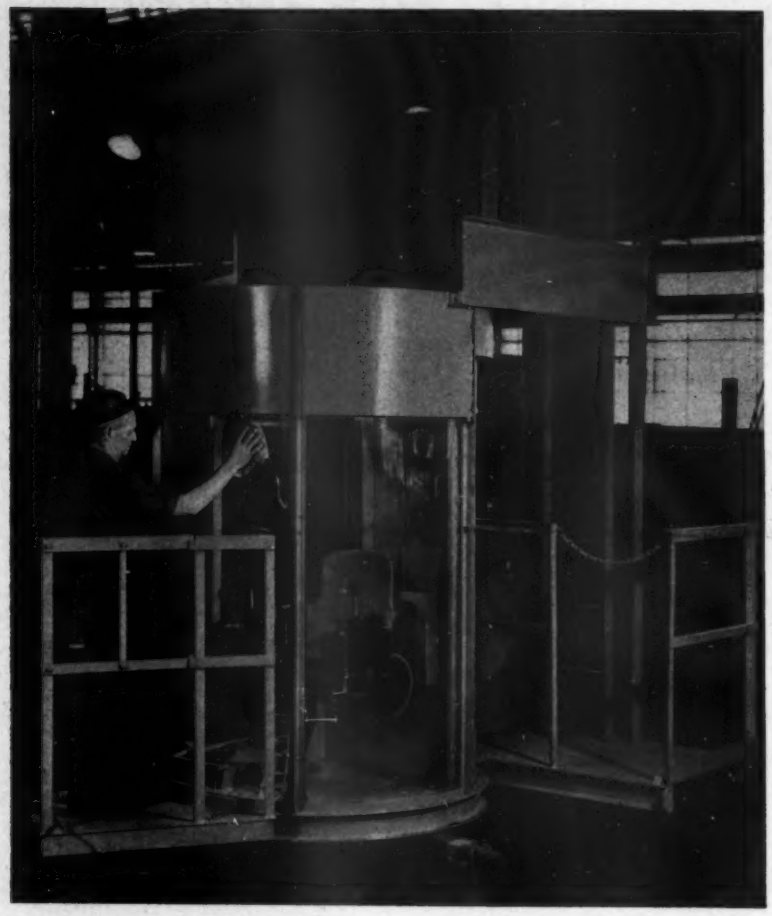
Sales Division of BEVIL CO., Los Angeles

NEW EQUIPMENT AND SUPPLIES

INNOVATION IN CAB DESIGN



The Cleveland Crane & Engineering Co., Wickliffe, Ohio, has developed a radical innovation in cab design for overhead traveling cranes. It is cylindrical in shape and corners or blind vision spots are eliminated.

The transparent enclosure panels extend to the floor, permitting maximum vision in every direction over the area covered by the crane. The panels are of a plastic which is shatter proof and impervious to certain gases common in many plants that may be injurious to glass.

Master switches especially designed for magnetic control are located for greatest convenience. Hoist and trolley switches are attached to the right and left arms of the chair. The bridge switch is on the floor and controlled with the right foot.

An air-cooled air-conditioning unit provides fresh clean air at any normal temperature desired and gives protection against gases, dusts and fumes.

This new cab may be furnished with any new crane employing magnetic control and it may be applied to existing cranes of any make.

COMPOUNDED OIL AND RUST PREVENTATIVE

The Hood Refining Co., Greensburg, Pa., manufacturers of oils and greases for industrial use, announces Gibraltar "Rad-Treat"—a compounded oil and rust preventative which emulsifies quickly with water or any anti-freeze. It is not a solvent but will keep radiators, water jackets and cooling systems clean and will prevent rust and corrosion.

Rad-Treat is not harmful to metal and will not attack rubber. It will keep emulsified and will not settle out.

UNIFORMITY IN SURFACE CONTROL

The Surface Checking Gage Co., Hollywood, California, has produced the SURF-CHEK Roughness Standards to meet the trend toward ever-increasing uniformity in surface control.

The kit contains a 65-page educational text bound to a gage consisting of 20 replicas of machined surfaces, prepared by turning, grinding, milling, honing, lapping and polishing, which vary in roughness from 500 to 5 microinches. The replicas are moulded into a 5x7 inch plastic plate through the use of precise die inserts.

The SURF-CHEK method of designation eliminates guess interpretation, conveys the engineer's specific instructions to the machinist, and enables anyone to make rapid and efficient roughness comparisons, without the need of any other special instruments.

CATALOGUES RECEIVED

Bailey Meter Company, 1050 Ivanhoe Road, Cleveland, Ohio, has published Bulletin No. 230-A featuring the Bailey Pyrotron Electronic Resistance Termometers in indicating, recording and controlling models, for temperature ranges between the limits of minus 100 degrees F and plus 1200 degrees F.

The 12-page bulletin lists outstanding features; describes the electronic detector and motor control; gives definite information on — ranges, power supply required, speed of response, accuracy, sensitivity, installation, etc.

The Monarch Machine Tool Co., Sidney, Ohio, has recently published two new booklets on their equipment. "The Shapemaster" describes and illustrates their mould forming and duplicating machine which will turn, bore and face various types of multi-sided shapes in irregular contour pieces.

The second booklet, "Modernize with Monarch," describes the Monarch-Keller Form Turning Machine which is used for roughing and finishing the irregular contour of a glass bottle mould. Duplicate moulds from the original template can be made to extreme accuracy limits. Also illustrated is the wide variety of varied shaped templates permitting almost unlimited possibilities for reproducing irregular contours on the Monarch-Keller lathe.

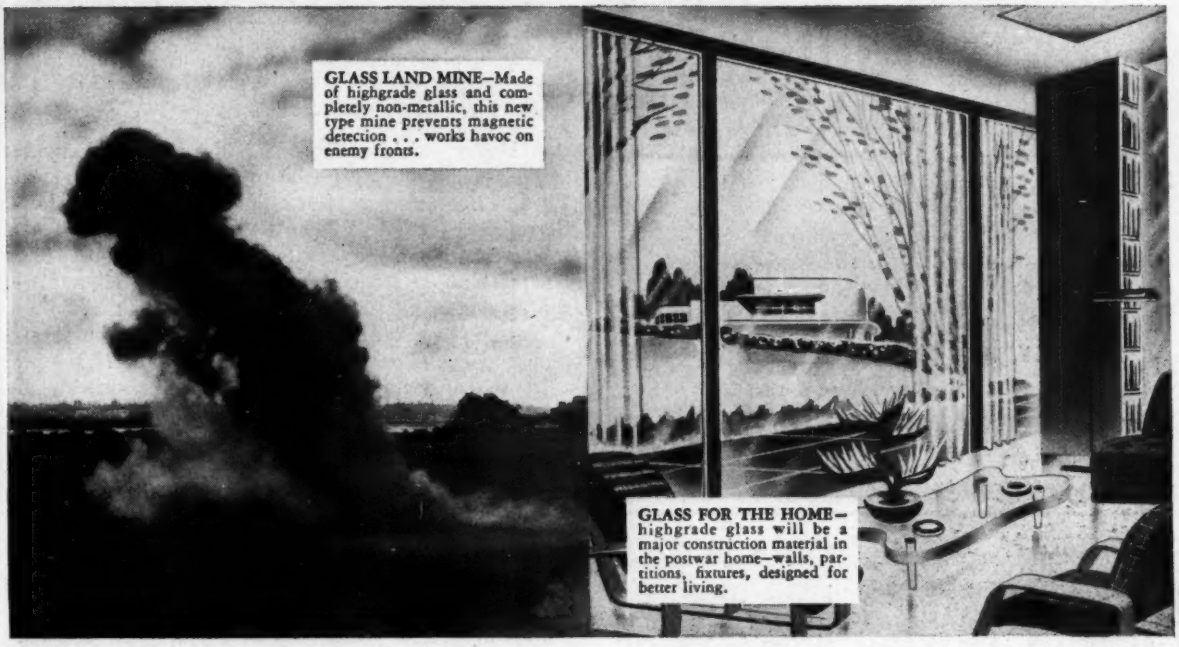
The Sturgis Products Co., Sturgis, Michigan, has just released a new bulletin describing Roto-Finish—the mechanical process for de-burring and finishing metal parts.

Accuracy of the Roto-Finish Process is illustrated and described with information presented on the closely controlled cutting actions that provide fine surface finishing to heavy grinding cuts.

Chain Belt Company, Milwaukee, Wis., has published a four-page folder, Bulletin No. 461, on their Rex Table Top Chain Belt. The leaflet pictures and describes this new flat-top conveyor chain. It shows the outstanding points in construction and describes details which make this type chain different from others. The chain has wide application in food handling and bottling or capping processes.

SOLVAY*

...KEYED TO TODAY AND TOMORROW!



GLASS LAND MINE—Made of highgrade glass and completely non-metallic, this new type mine prevents magnetic detection . . . works havoc on enemy fronts.

GLASS FOR THE HOME—highgrade glass will be a major construction material in the postwar home—walls, partitions, fixtures, designed for better living.

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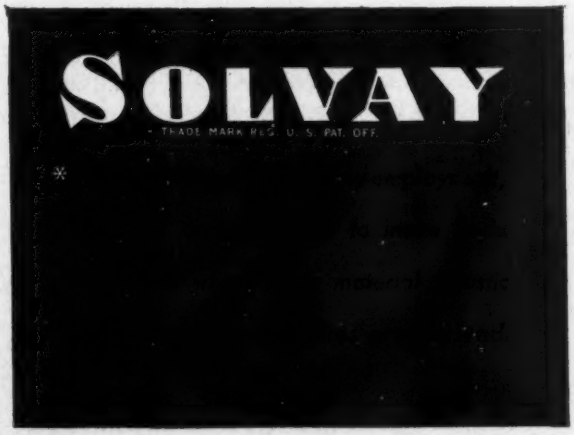
Tomorrow . . . will witness the dynamic expansion of a truly great Glass Industry. Solvay with its broad background of long experience and continuous research will keep in step with all new advances in glass—supplying quality alkalies to America's great industries.



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INVENTIONS AND INVENTORS . . .

(*Continued from page* 241)

face by means of a glass cutter set at an inwardly pointing angle. Then the surrounding glass may be slightly flexed to produce fracture. Finally heat is applied to the outer section of glass from the lower side to cause it to expand and free itself from the inner section.

In using a wooden former for the shaping of glass sheets which are to be bent, charring occurs in the center at the line where contact with the glass first occurs. Lewis Jex-Blake Forbes and Geo. W. T. Bird of Prescot, England, propose in patent 2,372,418 to build up a form by using numerous wooden slats which are held rigidly in place and are individually replaceable.

Glass Wool and Fiber

A binder which renders glass fibers soft and supple and highly suited for textile use is disclosed in patent 2,371,933, granted to Hans Steinbock of Dusseldorf-Gerresheim (vested in the Alien Property Custodian). It consists of a water emulsion containing 3 to 5 per cent each of gelatine, animal or vegetable oil and an emulsifying agent such as fatty acid sulphonate.

Wm. M. Rast and David M. Musser of Pittsburgh assigned to The Glenn L. Martin Co. patent 2,371,313 for a process of making structural material consisting of fiber reinforced plastic.

WALSH REFRACTORIES ANSWERS FTC COMPLAINT

The Walsh Refractories Corporation of St. Louis has filed an answer to the complaint issued by the Federal Trade Commission which charged it with mis-representation of the quality and composition of fire brick products.

The complaint alleged that among the products manufactured and sold by the respondent are a fire brick branded "Walsh Ref. Corp. Mullitex" and a cement labeled "Walsh Mullitex High Temperature Cement," and that in advertising these products the respondent represents falsely that its fire brick and cement possess the super-heat resisting qualities of mullite, which is a combination of aluminum oxide and silicon oxide blended by extreme heat.

The answer admits that the respondent has made the representations alleged in the complaint but denies that such representations are false or misleading. The respondent alleges that a group of its competitors, banded together under the name of Refractories Development Corporation, of Toledo, has sought to appropriate exclusive use of the word "mullite" as indicating certain special refractory materials heretofore made and now being made by such competitors according to certain patents owned or controlled by them; that none of the so-called "mullite" refractories made by these competitors are constituted entirely of mullite; and that if the respondent is required to desist from truthfully representing that its products contain substantial percentages of mullite, the monopoly of these patents will be effectively extended beyond the lawful terms thereof.

THREE CORNING EMPLOYEES WIN RECOGNITION

According to a recent announcement from the Corning Glass Works, three long-time employees have won new recognition in the company.

Edward C. Leibig, production manager of the Technical Products Division, has been promoted to the position of assistant to the director of glass technology, Vice President William C. Taylor. Justin J. Pfeiffer, manager of the company's Central Falls, Rhode Island, plant, has been advanced to manager of manufacturing for the Technical Products Division, and D. Kenneth Shaddock, production superintendent of the Central Falls plant, succeeds Mr. Pfeiffer as plant manager.

Mr. Leibig became associated with Corning sixteen years ago, and some of the positions he has held are as follows: head of processing operations at Corning, assistant to the production manager for Main and Pressware plants, and the position he held at the time of his new appointment.

Mr. Pfeiffer joined the Corning staff in 1917. His service has been in both sales and production departments, principally in the Bulk and Tubing Division.

Mr. Shaddock came to Corning in 1925 as an assistant in the chemistry laboratory. After a varied experience in research laboratories and study at Purdue University, he was assigned by the company to the handling of metallurgical problems. He became production superintendent of the Central Falls plant in 1943.

McCONNELL NAMED ASSISTANT DIRECTOR OF SALES AT DIAMOND ALKALI

Announcement has been received of the Appointment of William H. McConnell as an Assistant Director of Sales of the Diamond Alkali Company.

Prior to his appointment, Mr. McConnell was Vice President of the Benner Chemical Company, Chicago, distributors of Diamond Alkali products. Before joining the Benner Company, he was a member of the sales department of Diamond Alkali in Pittsburgh.

ADDITIONS MADE TO STAFF OF ARTHUR D. LITTLE, INC.

Two recent appointments to the staff of Arthur D. Little, Inc., Cambridge, Massachusetts, industrial research organization, have been announced.

They are Dr. W. B. Pings, organic chemist, previously at the Experimental Station of E. I. duPont de Nemours & Company; and David E. Acker, chemical engineer, formerly associated with the B. B. Chemical Co.

• L. A. Messimer has recently taken the position of Glass Technologist and Assistant Works Manager with The Holophane Co., Newark, Ohio. He is a ceramic engineer and has been a staff member of the Clay and Siliciate Products Division, National Bureau of Standards, for the past fourteen years, his most recent assignment having been with the Optical Glass Section of the Bureau.

Why 109 Kinds of Optical Glass?

Bending light to the will of man, making it accomplish miracles, this is the job that optical glass does . . . in industry, science, medicine, and in the service of our armed forces.

Creating the required types of glass, and adapting them to the thousands of precision operations they are to perform, is the task of Bausch & Lomb, America's large scale producer of optical glass and the only company currently producing 109 kinds.

Many of these glasses may look alike, but to the optical expert each is different. That difference is marked by specific qualities of refraction, dispersion, and transmission . . . the properties which determine how light is bent, broken up, and passed through a lens or prism.

Only by having available all of these types of glass . . . and the ability to create new types when needed . . . has Bausch & Lomb been able to meet the optical instrument needs of science and industry in times of peace . . . the needs of our armed forces for highly precise military optical instruments. These combined abilities . . . to create and produce fine optical glass and to utilize its properties to the fullest advantage . . . make Bausch & Lomb America's Optical Headquarters. Bausch & Lomb Optical Co., Rochester 2, New York.

BAUSCH & LOMB

ESTABLISHED 1853

Makers of Optical Glass and a Complete Line of Optical Instruments for Military Use, Education, Research, Industry, and Eyesight Correction and Conservation

(*Continued from page* 227)

NOTE: All figures are percentages.
In answering certain questions, for example Question 21, "Who trains employees in your plant?", some manufacturers indicated more than one method of training. Hence, the percentage shown is greater than 100.

		Containers		Plate Glass		Window Glass		Tableware		Any Other		All Glass	
		100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500
III. SAFETY AND HEALTH													
26. Do you have a safety engineer?	Full-time	18	12	—	—	50	—	—	33	6	75	12	31
	Part-time	6	62	100	—	—	—	—	50	18	—	12	41
	None	68	25	—	—	50	100	75	16	75	25	68	26
27. Do you have a Safety Committee?	Yes	56	100	100	—	50	100	50	66	50	100	53	89
	No	43	—	—	—	50	—	50	33	50	—	46	10
28. Do you have printed safety rules for distribution to all employees?	Yes	43	50	100	—	—	—	—	50	31	75	33	52
	No	56	50	—	—	100	100	100	50	68	25	66	47
29. Do you hold periodic safety conferences among supervisors?	Frequent	25	25	100	—	—	—	50	33	12	25	23	26
	Occasional	56	75	—	—	50	100	25	33	43	50	46	57
	None	18	—	—	—	50	—	25	33	43	25	30	15
30. How do you enforce safety rules?	Reprimand	87	97	100	—	50	100	75	83	81	100	82	87
	Layoff	18	37	—	—	50	—	—	33	25	75	20	41
	Discharge	12	37	—	—	50	—	—	33	12	50	12	36
31. Who pays for safety accessories, such as gloves, respirators, etc.?	Company	100	100	100	—	100	100	100	100	100	100	100	100
	Employees	18	12	—	—	50	—	25	—	12	—	17	5
32. Do you teach first aid to your employees?	Yes	37	62	100	—	50	—	25	16	18	75	30	47
	No	56	37	—	—	50	100	75	83	81	25	66	52
33. Do you have a physician in your plant?	Full-time	—	—	—	—	—	—	—	16	6	25	2	10
	Part-time	12	50	100	—	—	—	25	33	18	75	17	47
	None	87	37	—	—	100	100	75	50	75	—	79	36
34. Do you have a registered nurse?	Full-time	—	75	100	—	—	—	50	83	25	100	17	78
	Part-time	6	—	—	—	—	—	—	—	6	—	5	—
	None	93	25	—	—	100	100	50	16	68	—	76	21
35. Do you maintain a visiting nurse system?	Yes	—	37	—	—	—	—	—	—	12	—	5	15
	No	100	50	100	—	100	100	100	83	87	100	89	73
36. Do you have a medical room for emergency treatment?	Yes	37	75	100	—	50	100	75	83	62	100	53	84
	No	55	25	—	—	50	—	25	16	37	—	43	15
37. Do you give pre-employment physical examinations?	Yes	31	75	100	—	50	100	50	83	43	100	41	84
	No	68	25	—	—	50	—	50	16	56	—	56	15
38. Do you provide periodic physical check-ups?	Yes	6	50	100	—	50	—	25	50	12	50	15	47
	No	93	50	—	—	50	100	75	50	87	50	84	52
39. Do you have a relaxation room for women workers?	Yes	68	100	100	—	50	100	75	100	68	100	68	100
	No	18	—	—	—	50	—	25	—	25	—	23	—
40. Do you have a relaxation room for male workers?	Yes	31	50	100	—	50	100	25	50	37	75	35	57
	No	68	50	—	—	50	—	75	50	62	25	64	41
41. What provision do you make for lockers?	Individual lockers.	87	62	100	—	100	100	50	100	50	50	68	73
	Group locker	—	25	—	—	—	—	—	—	25	25	10	15
	None	18	—	—	—	—	—	50	—	31	25	25	5
42. Are separate lockers provided for work clothes, shoes, etc.?	Yes	37	25	100	—	—	—	25	33	25	25	30	26
	No	50	37	—	—	100	100	75	66	56	50	56	47
43. Where are the lockers?	In separate rooms.	62	75	100	—	50	100	25	66	50	75	53	73
	In the shop	31	12	—	—	50	—	—	33	12	—	20	15
44. Do you have showers for employees?	Yes	87	100	—	—	100	100	75	83	68	75	76	89
	No	12	—	100	—	—	—	25	—	25	25	20	5
45. Do employees get wash-up time?	Yes	25	12	100	—	—	—	—	33	25	25	23	21
	No	68	97	—	—	100	100	75	66	68	75	68	78
46. Do you have separate smoking areas?	Yes	56	100	100	—	50	100	25	83	56	50	53	84
	No	43	—	—	—	50	—	75	16	43	50	46	15
47. Do you maintain in-plant eating facilities?	Cafeteria	—	50	—	—	—	—	—	33	18	100	7	52
	Snack bar	12	25	100	—	50	—	25	16	12	25	17	21
	None	87	25	—	—	50	100	75	66	68	—	74	36
48. Do you provide between-meal snacks for workers?	Yes	18	37	—	—	50	—	—	16	12	75	15	36
	No	81	62	100	—	50	100	100	83	87	25	84	63
49. Have you soft drink and candy dispensers?	Yes	93	97	100	—	100	100	25	66	68	100	76	84
	No	—	12	—	—	—	—	75	33	25	—	17	15
50. Do you provide rest periods?	Yes	50	25	100	—	50	—	50	100	68	50	58	52
	For certain groups	31	75	—	—	—	100	50	—	6	50	20	47
	No	12	—	—	—	50	—	—	—	18	—	15	—
51. Are adequate safeguards employed against dust, fumes, excessive heat?	Yes	87	100	100	—	100	100	75	100	93	100	89	100
	No	12	—	—	—	—	—	25	—	—	—	7	—
52. Do you have an established methods procedure for each task?	Yes	31	62	100	—	50	—	50	66	75	75	53	63
	No	68	37	—	—	50	100	25	33	12	25	38	36

NOTE: All figures are percentages: In answering certain questions, for example Question 21, "Who trains employees in your plant?", some manufacturers indicated more than one method of training. Hence, the percentage shown is greater than 100.		Containers		Plate Glass		Window Glass		Tableware		Any Other		All Glass	
		100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500	100 to 500	Over 500
53. Do you have an established plant housekeeping program?	Yes	62	75	100	—	50	100	50	100	56	100	58	89
	No	37	25	—	—	50	—	50	—	31	—	35	10
54. Do you maintain a special staff responsible for maintenance, repair and replacement?	Yes	87	100	100	—	100	100	75	100	68	100	79	100
	No	—	—	—	—	—	—	—	—	6	—	2	—
	Done by workers	12	—	—	—	—	—	25	—	18	—	15	—
55. Have you a scheduled routine for keeping floors free of oil, scrap and obstructions?	Yes	87	97	100	—	50	100	75	83	75	100	79	89
	No	12	12	—	—	50	—	25	16	12	—	15	10
IV. ABSENTEEISM AND TURNOVER													
56. Do you keep absenteeism records?	Yes	50	100	100	—	100	100	25	66	50	100	51	84
	No	50	—	—	—	—	—	50	33	37	—	41	10
57. Do you conduct post-absence interviews?	Yes	56	100	100	—	100	100	25	33	62	100	58	78
	No	37	—	—	—	—	—	50	66	25	—	30	21
58. Do you keep records of turnover and reasons for leaving?	Yes	68	100	100	—	50	100	50	100	43	100	56	100
	No	31	—	—	—	50	—	25	—	50	—	38	—
V. GENERAL													
59. Is your plant the only one operated by your company?	Yes	62	37	100	—	50	—	50	50	81	—	68	31
	No	37	62	—	—	50	100	25	50	12	100	25	68
60. If No, are working conditions governed by plant unit, company policy or both?	Plant unit	18	—	—	—	50	—	—	—	—	—	10	—
	Company policy	6	50	—	—	—	100	75	16	—	50	10	41
	Both	12	12	—	—	—	—	—	—	12	50	10	15

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BOOK REVIEW

"JOB SAFETY TRAINING MANUAL"

by Kenneth L. Faist and Stanton M. Newkirk

This manual provides a brief, intensive training program for foremen and supervisors composed of five, two-hour sessions. Simple and basic, it contains a practical technique for the prevention of accidents that is applicable to every type of job.

The manual is organized to serve as a working tool in conducting Job Safety Training sessions. It provides everything the conference leader needs to carry out a plantwise safety training program. Both foremen and workers receive materials which grow out of training sessions and are geared to their own practical needs. Supplements included with the manual are used at specific points in the training sessions to deepen, enlarge and fix as a part of his job safety pattern, the technique of safety the participant has himself demonstrated visually, orally and manually during his JST instruction.

Published by National Foremen's Institute, Inc., Deep River, Connecticut. The price is $5.00 plus postage.

ABSTRACTS OF ALIEN PATENTS ON GLASS NOW AVAILABLE

The Alien Property Custodian has recently announced the publication of printed abstracts or short descriptions of about 45,000 United States patents and patent applications, seized from enemy aliens and nationals of occupied countries, which are now available for license to American citizens. These abstracts are divided into two groups, one Chemical and the other Mechanical-Electrical. Many of the inventions are of direct interest to the glass, ceramic and cement industries.

The Chemical Abstracts have been grouped into 33 Sections covering the fields of ceramics, petroleum, metallurgy, heavy chemicals, protective and decorative coatings, etc. These Sections contain about 2,200 pages and cover about 8,000 patents and patent applications.

The Mechanical-Electrical Abstracts cover about 37,000 patents and patent applications and are grouped into the 300 classes and sub-classes used by the U. S. Patent Office. These abstracts cover the manufacture of glass, ceramic and cement products and include many items of equipment used in their manufacture.

1907 was a great year . . .

and 1917 was one of historic importance

In 1917 a proclamation by President Wilson declared the United States at war with Germany . . . the drawing of numbers in the first draft for military service took place in Washington . . . an American force was sent to France over which Gen. John J. Pershing was appointed Commander-in-Chief. . . . The Czar of Russia abdicated and later a Bolshevik government under Lenin was formed.

It was the 10th anniversary year of Banner Lime, then an established product of quality and uniformity that was aiding wartime agriculture, construction and industry. National Mortar & Supply Co., Grant Bldg., Pittsburgh, Pa. Established 1907.

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HAINES RETURNS TO THE UNITED STATES

Harrison W. Haines, whose broad experience in glass plant operations in South America for the International General Electric Company is well known and who, for the past six months, has been associated in an advisory capacity with Mexico's largest glass company, Vidrio Plano, in Monterrey, has announced that he has left this post and returned to the United States.

Mr. Haines will continue in the employ of the Monterrey concern but in the near future expects to be engaged in postwar projects for a large manufacturer in further developments of glass manufacturing activities in foreign fields. Prior to his association with the Mexican plant Mr. Haines was president of the DeMuth Glass Company.

PITTSBURGH BOARD OF EDUCATION INCLUDES STUDY OF GLASS IN SCHOOL CURRICULUM

Classes in design, fabrication, and application of glass have been included in the Distributive Education Courses conducted by the Pittsburgh Board of Education in the short-term spring sessions. The lecturer is E. A. Lundberg, head of the Architectural Department of the Pittsburgh Plate Glass Company.

The inclusion of these special classes has been prompted by the growing popular interest in glass as both a structural and decorative medium which has been stimulated by the wartime uses of this material on the fighting and industrial fronts.

These lectures have been given in the Board Room of the Company beginning April 11th and will be held weekly for a six week period. Movies of the glass making processes and exhibits of special wartime glass developments will be included in the course.

CANTON GLASS EXPANDS PRIVATE MOULD DEPARTMENT

The Canton Glass Company of Marion, Indiana, has announced the expansion of the department supervising the company's overall program on private mould production. It is stated that this change in no way effects production on their standard lines. However, inquiries from manufacturers in widely varied lines, relative to private mould production has indicated a heavier postwar demand and the need for an enlarged staff to expedite preliminary planning and to develop a practical manufacturing procedure on each particular design.

In addition to its standard items, the company has, for more than forty years, engaged in private mould production on such lines as marine, industrial, domestic and laboratory equipment. During the last five years this branch of the business has been further developed to meet military requirements.

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VACUUM-TUBE ANTICIPATOR CONTROLS FURNACE TEMPERATURES

Westinghouse Electic and Manufacturing Company, Pittsburgh, Pa., has announced the development of a vacuum-tube thermocouple device characterized by its anticipating nature, which increases the sensitivity and response of conventional temperature controls by a thousand per cent.

This instrument consists of two thermocouples of different thermal capacity and an electric heating element, enclosed in an evacuated glass envelope to cause heating of the thermocouples by radiation, to minimize room temperature effects, and to prevent deterioration of the elements. Changes in electric furnace temperatures are anticipated and corrective steps taken to minimize the cyclic swings in temperature characteristic of most furnace controls.

NEW FLUORESCENT LAMPS BY WESTINGHOUSE

The Westinghouse Electric and Manufacturing Company has announced the development of their new Slimline fluorescent lamps—so-called because they are longer and more slender than the present standard line. They are of the high efficiency hot cathode type, as are the other fluorescent lamps but are designed for "instant start" operation without starters. They can be operated at various levels of wattage output and brightness. The compact cathode and base structure of the lamps results in the maximum continuity in the line of light formed when the lamps are mounted end to end.

The lamps will be available first in the standard white but ultimately will also be produced in daylight and in colors. The lamps will be made in four sizes. They are the 42″ T6; the 64″ T6; the 72″ T8; and the 96″ T8.

HANGARS OF GLASS CLOTH TO HOUSE WAR PLANES

The Owens-Corning Fiberglas Corporation is to supply glass cloth, woven of glass fiber yarns, and coated with either synthetic rubber or resin, to the U. S. Army Corps of Engineers for curtains, side walls and ends in newly developed airplane hangars installed at advance Army Air Forces bases.

Structural steel frame work and coated glass cloth are shipped to advance bases where the hangars are assembled for the A.A.F. The use of this coated glass fabric for section of hangars saves a great amount of shipping weight and speeds assembly of the hangars.

PITTSBURGH PLATE APPOINTS EXPORT MANAGER

The Pittsburgh Plate Glass Company has just announced that J. H. Henshaw has been named general export manager. Mr. Henshaw joined the staff of Pittsburgh Plate in 1931 and served in several capacities until 1939 when he became assistant manager of the Boston unit, which position he held until his recent appointment.

• Announcement has been received from the Thatcher Manufacturing Company of the appointment of Richard T. O'Connor as purchasing agent. This appointment became effective April 1st.

PITTSBURGH SECTION OF ACS MEETS

The Spring Meeting of the Pittsburgh Section of the American Ceramic Society is scheduled for May 11th at Mellon Institute. The committee in charge of the program includes: Arthur Wells, Chairman; Norbert Garbisch, Keith McAfee and Francis Flint.

Chairman H. E. Simpson will preside and among the six papers to be presented are two specifically pertaining to glass.

After the presentation of papers a dinner will be held at the University Club followed by entertainment. Following is the list of papers scheduled.

"War Veterans in the Postwar Ceramic Industry" by J. E. Eagle, Chief, Non-Metals Section, Miscellaneous Minerals Division, W. P. B., Washington.

"Microstrength of Glass" by H. W. Powell and F. W. Preston, Preston Laboratories, Butler, Pa.

"Flow Lines in a Continuous Melting Glass Furnace as Determined by Cobalt Oxide and Pictured in Color Photographs" by Vernon W. Lenz, Owens-Corning Fiberglas Corp., Newark, Ohio.

"Recuperation in Direct-Fired Tunnel Kilns" By Philip Dressler, Swindell-Dressler Corp., Pittsburgh, Pa.

"Development of Zircon as a Versatile Ceramic Material" by N. R. Thielke and H. W. Jamison, Orefraction, Inc., Pittsburgh, Pa.

"X-ray Diffraction Data for Compounds in the CaO-MgO-SiO_2 System" by C. Burton Clark, Harbison-Walker Refractories Co., Pittsburgh, Pa.

PITTSBURGH PLATE OPENS NEW SALES OFFICE IN SAN FRANCISCO

The Pittsburgh Plate Glass Company's Columbia Chemical Division has announced the appointment of I. G. Stewart as manager of their new San Francisco office. Mr. Stewart has had twenty-two years' experience in the heavy chemical field.

The new district sales office is being opened to serve buyers of heavy chemicals on the West Coast, and follows the acquisition of the Pacific Alkali Company, Bartlett, California, by the Columbia Chemical Division of Pittsburgh Plate.

The new office will be devoted only to the sale of heavy chemicals and was installed because of the increasing importance of West Coast activities.

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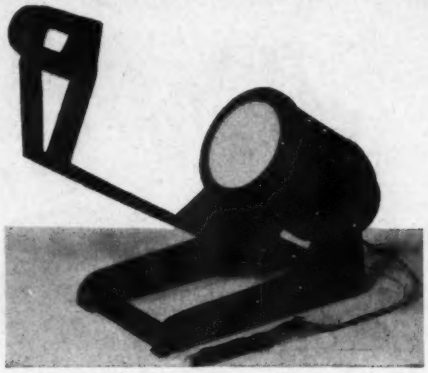

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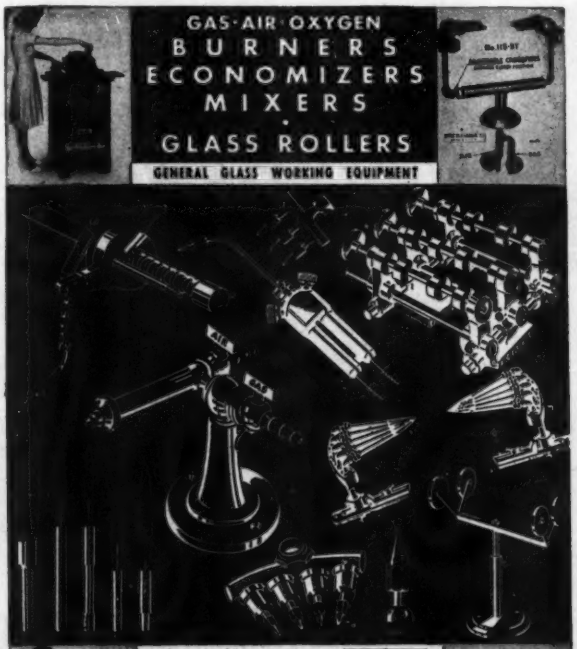

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